DISSERTATION ABSTRACTS

ABSTRACTS OF DISSERTATIONS AND MONOGRAPHS IN MICROFORM

UNIVERSITY MICROFILMS ANN ARBOR, MICHIGAN: 1957



DOCTORAL DISSERTATION SERIES Cooperating Institutions

Alabama Polytechnic Institute

The American University

University of Arizona

University of Arkansas

Boston University (Schools of Education and Theology)

Bradley University

Brown University

Bryn Mawr College

The University of Buffalo

Case Institute of Technology

University of Cincinnati (including Teachers College)

The Claremont Graduate School

Clark University

University of Colorado

Colorado Agricultural and Mechanical College

Colorado State College of Education

Columbia University

The University of Connecticut

Cornell University (including Cornell Medical College)

The University of Florida

The Florida State University

George Peabody College for Teachers

University of Georgia

The Hartford Seminary Foundation

University of Houston

University of Illinois (including Chicago Professional Colleges)

Indiana University (including the Graduate Schools of Business, Education and Music)

State University of Iowa

University of Kansas

Kansas State College

Lehigh University

Louisiana State University

University of Maryland

University of Michigan

Michigan State University

University of Minnesota

University of Missouri

The University of Nebraska (including School of Education)

The University of New Mexico (including School of Education)

New York University (including Graduate and Education Schools)

North Carolina State College

Northwestern University

University of Notre Dame

The Ohio State University

The University of Oklahoma

University of Oregon

Oregon State College

University of Pennsylvania

The Pennsylvania State University

University of Pittsburgh

Polytechnic Institute of Brooklyn

Princeton University

Purdue University

Rensselaer Polytechnic Institute

Rutgers University

St. Louis University

University of South Carolina

Stanford University.

Syracuse University

Temple University

The University of Tennessee

North Texas State College

Tulane University

University of Utah

Vanderbilt University

University of Virginia

Virginia Polytechnic Institute

State College of Washington

Washington University

University of Washington

Wayne University

The University of Wisconsin

Yale University

Yeshiva University

DISSERTATION ABSTRACTS

ABSTRACTS OF DISSERTATIONS AND MONOGRAPHS IN MICROFORM

UNIVERSITY MICROFILMS ANN ARBOR, MICHIGAN: 1957

LITHOPRINTED IN THE UNITED STATES OF AMERICA BY CUSHING - MALLOY, INC., ANN ARBOR, MICHIGAN, 1957

INTRODUCTION

This year *Dissertation Abstracts* will carry, as the 13th issue of Volume XVII, an index to all doctoral dissertations published in the United States and Canada. This issue will be titled *Index to American Doctoral Dissertations*, and will be a continuation of *Doctoral Dissertations Accepted by American Universities*.¹ The joining of these two reference works makes it possible for librarians to have an integrated bibliographical research tool relating to doctoral dissertations under one cover.

Dissertation Abstracts will continue to provide abstracts of dissertations by recipients of doctoral degrees from graduate schools cooperating with University Microfilms in the publication of complete dissertation texts on microfilm, on Microcards, or as microprint. At the end of each abstract will be found an indication of the number of pages in the original typescript and the Library of Congress card number, for the convenience of scholars and research workers. In some instances Dissertation Abstracts will be found to be an adequate substitute for the published dissertations.

The *Index to American Doctoral Dissertations* will be a complete indexed listing of dissertations by students who were granted doctoral degrees during the previous academic year, and including those abstracted in *Dissertation Abstracts*, arranged by degree-granting institutions under appropriate subject headings. An alphabetical author index will be included.

The tabular material which has been an established part of its predecessor volume will be included in full, so arranged that statistical summaries can be maintained with no break in continuity.

It is hoped that those who use *Dissertation Abstracts* will continue to make suggestions for its improvement, as these are vital to its continued life and growth. Several suggestions for changes in the headings used for indexing purposes have been received, and a committee of the Association of Research Libraries is reviewing the indexing system at the present time as a result of these suggestions.

¹Arnold H. Trotier and Marian Harman, (eds.), *Doctoral Dissertations Accepted by American Universities*. (New York: H. W. Wilson Co., 1933-1955.)

Back Issues

Libraries wishing to complete their files of DISSERTATION ABSTRACTS (MICROFILM ABSTRACTS prior to volume XII) may purchase the following issues, of which we have a small supply, at the standard price of \$1.50 each issue.

| VOL. | ISSUE | VOL. | ISSUE |
|------|--------|------|-------|
| 10 | 3 | 13 | 1 |
| | 4 | | 2 |
| | | | 2 3 |
| 11 | 1 | | |
| | 2 | 15 | 6 |
| | 2 3 | | 7 |
| | 4 | | 8 |
| | | | 9 |
| 12 | 1 | | 11 |
| | 2 | | 12 |
| | 3 | | |
| | 4 | | |
| | 5 | | |
| | 6 | | |

A microfilm of volumes 1-16 can also be supplied at the following prices:

| VOLS. | PRICE |
|------------------|---------|
| 1- 5 (complete) | \$10.00 |
| 6-10 (complete) | 30.00 |
| 11-13 (ea. vol.) | 12.00 |
| 14-16 (ea. vol.) | 20.00 |

DISSERTATION ABSTRACTS is published monthly by University Microfilms, 313 North First Street, Ann Arbor, Michigan. Subscription rates are: a. Dissertation Abstracts alone for 12 issues with no annual index: \$20.00 in the United States; \$22.00 foreign; b. a combined subscription to Dissertation Abstracts with the 13th index number, paper bound as the other issues: \$25.50; c. the Index to American Doctoral Dissertations alone, bound in hard covers: \$8.00.

TABLE OF CONTENTS

The Table of Contents lists in alphabetical order the principal subject headings of the dissertations abstracted. For the convenience of readers an alphabetical author index is included following the abstracts.

| AGRICULTURE 45 | 5 |
|----------------------------|----|
| ANATOMY 47 | 5 |
| ASTRONOMY 47 | 6 |
| BACTERIOLOGY 47 | 7 |
| BIOLOGY - GENETICS | 1 |
| BOTANY | 4 |
| CHEMISTRY | 0 |
| ECONOMICS | .7 |
| EDUCATION | 28 |
| ENGINEERING 58 | 10 |
| ENTOMOLOGY 59 |)2 |
| FINE ARTS 59 |)3 |
| FOOD TECHNOLOGY |)5 |
| GEOGRAPHY 59 |)6 |
| GEOLOGY 59 |)7 |
| HEALTH SCIENCES |)3 |
| HISTORY 60 |)6 |
| HOME ECONOMICS | 17 |
| JOURNALISM 61 | 18 |
| LANGUAGE AND LITERATURE 61 | 19 |
| MATHEMATICS | 39 |
| MUSIC | 16 |
| PHILOSOPHY | 48 |

| PHYSICS | • • • • | | • • • | • | • | • • | • | • | • | • | • | • | • | • | • | • | • | • • | • | • | • | • | • | • | • | • | • | • • | • | • | • | • | • | • | • | • | • | 65 |
|----------|---------|-----|-------|----|---|-----|---|-------|---|---|---|-------|---|---|-------|---|---|-----|---|---|---|---|---|-------|---|---|---|-----|---|---|---|---|---|-------|---|---|---|----|
| PHYSIOL | OGY . | | | | • | | • | | | | | | • | • | | | • | | | • | | • | | | | • | | | | • | | | • | | | • | • | 66 |
| POLITICA | AL SC | IEN | CE | | • | | | | | | | | | • | | | • | | | • | | • | | | | | | | | | • | | • | | | • | | 66 |
| PSYCHOL | OGY. | ٠. | | | • | | • | | | • | | • | | • | | | | | | • | • | | • | • | | | • | | | • | • | | | | | | | 67 |
| RELIGION | ١ | ٠. | | | • | | | | | | • | | | • | | | | | | • | | | | | | | | | | • | • | | | | | • | | 68 |
| SOCIAL I | PSYCH | OL | OG? | γ. | • | | • | | | | | | • | • | | | | | | | • | • | • | | | • | | | | • | | • | • | | • | | • | 68 |
| SOCIOLO | GY | ٠. | | | | | • | | | | • | • | | • | | • | • | • • | | | | • | • | • | • | | | | | • | • | • | • | | • | | • | 68 |
| SPEECH | - THE | FAT | ER | | • | | | | | | • | | | • | | • | | • • | | | | • | | • | | | | | | • | • | • | • | • | • | | • | 69 |
| ZOOLOGY | · | | | | • | | • | • | | | | | | • | | • | | | | | | • | | | • | • | | | • | • | | • | • | | | | | 69 |
| AUTHOR | INDE | х. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 70 |

AGRICULTURE

AGRICULTURE, GENERAL

THE ECONOMICS OF SCALE IN COMMERCIAL EGG PRODUCTION, NEW YORK STATE, 1954-55

(Publication No. 20,407)

John Marvin Bailey, Ph.D. Cornell University, 1956

The primary purpose of this study was to determine the effects of size of laying flock on various economic factors important in commercial egg production.

Primary data from 64 New York State commercial poultry farms served as the basis for the analysis. Records were restricted to Leghorn flocks producing market eggs for the year ending August 31, 1955.

Flocks ranged in size from 1506 layers to 17,436 layers per farm. Three classes were formed for analysis purposes, as follows: flocks with less than 3000 layers, 3000 - 5000, and over 5000 layers per farm with respective class averages of 2380, 3944, and 6982 layers per farm.

Physical Data

The flocks in this study averaged 21.7 per cent mortality, 193 eggs per layer, and 106 pounds of feed per layer. There were only slight differences in these factors when associated with size of the laying flock.

However, efficiency in the use of labor increased as flocks increased in size. Large flocks averaged about one hour per layer compared to 1.1 hours and 1.3 hours, respectively, for medium- and small-size flocks. While flocks with more than 5000 layers had the most economy in the use of labor, the greatest relative efficiency was in the medium-size flocks. Reduction in chore time accounted for most of the labor efficiencies.

Capital requirements for buildings and equipment, on a per layer basis, did not vary significantly between size groups. Average capital in buildings was \$4.18 per layer with capital in equipment averaging 54 cents per layer.

Costs and Returns

Total costs per layer decreased as flocks increased in size. Labor efficiencies and a lower wage rate for an increasing proportion of hired labor were factors responsible for making labor costs the principal item of cost reduction.

Costs per dozen eggs averaged nearly 52 cents; returns were about 43 cents per dozen, resulting in a loss for all flocks of almost 9 cents per dozen. Losses per dozen eggs decreased as flocks increased in size, from a 12.7 cent loss for small-size flocks to a loss of 5 cents per dozen for the flocks with more than 5000 layers.

By fully charging all costs, including the time of operators and unpaid family labor, net returns were negative, averaging a loss of \$1.25 per layer for all flocks. Small-size flocks averaged a loss of \$1.82 per layer compared

to losses per layer of \$1.16 and 70 cents, respectively, for the medium and large flocks.

Return per hour of labor averaged 41 cents for flocks with more than 5000 layers, 16 cents for flocks with from 3000 - 5000 layers, while flocks with less than 3000 layers averaged a loss of 10 cents per hour.

Factors Influencing Net Return per Layer

Egg production per layer was the most important factor influencing net return per layer, with a coefficient of determination of .29. The high one-third of the flocks in egg production averaged 222 eggs per layer and sustained a net loss of 23 cents per layer, while the low one-third with an average rate of lay of 160 eggs, had a loss of \$2.40 per layer.

Twenty-five per cent of the variability in net return was explained by variation in labor efficiency. Flocks which averaged .84 hours per layer had losses of 78 cents per layer. For flocks averaging 1.46 hours of labor per layer, the loss was \$1.80 per layer.

Only 11 per cent of the variability in net return per layer could be accounted for by size of flock.

The per cent of eggs sold as retail accounted for only 5 per cent of the variation in net return per layer.

101 pages. \$2.00. Mic 57-720

AN EMPIRICAL STUDY OF THE DECISION-MAKING PROCESS IN FARM MANAGEMENT (PARTS I-IV)

(Publication No. 19,400)

Elijah Denton Chastain, Jr., Ph.D. Purdue University, 1956

Major Professors: D. Woods Thomas and Lowell S. Hardin

This study dealt with one phase of entrepreneurial behavior in farm management, that of deliberate selection from alternatives. The investigation included testing of hypotheses dealing with the reasoning processes, the analytical methods and techniques, and the decision-making models employed by farm managers and the nature of managerial response to factor and product price changes and to technological changes.

The sample survey interview method of research was used in securing data for testing the hypotheses. The universe was limited by definition to single managerial farms receiving at least \$2500 gross farm income. The sample consisted of 1075 observations in eight geographic areas consisting of contiguous groups of whole counties located in Indiana, Iowa, Kansas, Kentucky, Michigan, North Dakota, and Ohio. Personnel of the agricultural experiment stations of each of these states cooperated in

the study. This report treats one phase of the regional study undertaken under the auspices of the Risk and Uncertainty Subcommittee, North Central Farm Management Research Committee.

Sample data were weighted for differences in sampling rate in preparing the estimates for the population. The data were subjected to the appropriate statistical test of significance, and the significant findings were included in the report of the study. The .10 level of probability was used as the minimum level for acceptance of the data.

The inductive and deductive reasoning processes were difficult for the managers to understand and to distinguish between because of their complex nature. Decision reconstruction furnished more meaningful information than did the posing of hypothetical situations in determing managerial reaction to and the use of these processes.

Population estimates indicated that about nine-tenths of the managers sometimes consider costs and results in making decisions with about one-half of the managers sometimes making such calculations in writing. Twothirds of the managers considered marginal data adequate for making production level and machinery purchase decisions; one-fourth to one-third considered average data adequate for making these same types of decisions.

Managers were asked to reconstruct recent decisions regarding (1) what and how much to produce, and (2) the purchase of their last major piece of machinery. Nearly one-half of the managers employed the land use approach in the former decision but meaningful proportions followed other approaches in making the decision. Evidence of analysis was identifiable in the replies of about nine-tenths of the managers regarding the purchase of the additional machine.

Other questions dealt with the nature of the adjustments in the production processes resulting from experienced factor and product price changes. Only about one-fourth of the managers adjusted their production as the result of an input price change, and about one-third of the managers adjusted their production as a result of the output price change. Managers were also asked to express their willingness to be first in their area to try out new developments and about 37 percent of the managers indicated that they were willing to sometimes be first.

The principal topics considered were studied in relation to the following variables: formal education, age, farm managerial experience, average gross farm income, net worth, ratio of debts to assets, acres operated in cropland and rotation pasture, type of farm, principal product of the business, degree of specialization, and tenure status. Meaningful relationships were evidenced which have value to the managers of farm businesses, researchers, educators, and service personnel having interests in the management of farm businesses.

The findings of this study contribute directly to a more realistic conceptual framework for making decisions in farm management, and, because of the exploratory nature of the study, it has provided an unusually large number of meaningful hypotheses deserving further investigation.

346 pages. \$4.45. Mic 57-721

FARM BUSINESS ADJUSTMENTS ON COMMERCIAL DAIRY FARMS, MONTGOMERY COUNTY, NEW YORK, 1944-45 AND 1954-55

(Publication No. 20,408)

Vance Ward Edmondson, Ph.D. Cornell University, 1956

Changing conditions and technologies which continually surround farm operators in their business management endeavors to maintain satisfactory incomes and improve efficiencies in their businesses, require unremitting adjustments in organization and operation of their farms. Successive periodic studies of such adjustments based on operator experiences, and analysis of the factors involved materially assist in making adjustment decisions to the benefit of the operator and society.

This study is a description of changes in farm organization and operation on commercial dairy farms during the ten-year period, 1944-45 to 1954-55 in Montgomery County, New York and an analysis of the relationships of factors affecting financial results.

The survey method was used to obtain the data for the study. Cross-tabulation analysis was facilitated by columnar and machine sort tabulations.

The physical characteristics of the area studied were described, including types of residences, topography, soils, climate and economic factors.

Ownership was a predominate way of holding real estate in both 1944-45 and 1954-55. The total acres operated per farm increased 14 per cent, much of which was by renting additional land. Crop land increased 7 per cent. Proportionately more of the crop land was devoted to forage crops in the recent survey year than ten years earlier. A high percentage of the crops of primary importance to the dairy enterprise was fertilized. About six times as much commercial fertilizer was used in the recent survey period as in the earlier period.

The average number of cows per herd increased from 22 cows in 1944-45 to 26 a decade later, an 18 per cent increase. Milk production per cow rose 22 per cent during the ten-year period. Grain fed per cow remained about the same while about one-half ton more of hay equivalent was fed. Some shift in seasonality of milk production toward winter months occurred.

The labor force remained about the same at a little less than 2 man equivalent while the size of business increased substantially.

The value of farm capital rose 83 per cent from 1944-45 to 1954-55 while receipts increased only 35 per cent and expenses 59 per cent.

The factors affecting the financial results of the farm operations in the survey area were analyzed. Certain analytic comparisons were made between the 1944-45 and 1954-55 data. Farms were arrayed by given factors and grouped into selected classes. Various associated factors were machine tabulated, and averaged for the respective groups of farms. The relationships of these factors to the factors on which the farms were sorted were studied. Four size factors were analyzed; total acres operated, number of cows, total work units and total product units. In addition, cows per man and rate of milk production per cow were analyzed.

It was found that additions to the size of business did not increase labor income as much in 1954-55 as was the

case in 1944-45. However, larger businesses generally made a better labor income than did the smaller farms. Farms with larger herds had higher producing cows and better crop yields. All sizes of farms fed about the same amount of grain per pound of milk. But more milk per ton of hay equivalent was obtained on the larger farms than on the smaller ones.

The efficient use of labor had associated with it relatively higher returns and lower costs at the higher levels of labor efficiency. The efficient use of labor assumed increasing importance in the recent survey period due largely to the relation of prices and costs.

It was found that labor incomes increased at about the same rate in 1954-55 as in 1944-45 as rate of milk production per cow increased. Farms with the higher producing cows had more satisfactory returns than did the farms with low producing cows.

The farm business adjustments during the decade between surveys have been toward greater specialization in milk production. 178 pages. \$2.35. Mic 57-722

OPTIMUM SHIPPING PATTERNS AND INTERMARKET PRICE RELATIONSHIPS FOR COMMERCIAL BROILERS

(Publication No. 20,190)

William Ray Henry, Ph.D. North Carolina State College, 1957

Supervisor: Charles Edwin Bishop

The objectives of this study were: (1) to estimate intermarket price relationships and volumes of interregional trading in equilibrium states of the national broiler market in 1954 and 1955, and (2) to compare net prices that could be obtained in alternative markets for North Carolina broilers in equilibrium states of the national broiler market.

Equilibrium states of the broiler market were estimated by using a fifty-seven region model of the national broiler trading system. Exogenous variables in this model are the regional borders, interregional transportation rates, and regional supply and demand levels. The exogenous variables were estimated from available market data. Endogenous variables in this model are interregional shipments and interregional price differentials (implicit). Equilibrium values of the endogenous variables were estimated by linear programming a pattern of interregional shipping that would result in a minimum total outlay for interregional transportation of broilers.

Norfolk, Philadelphia, and New York tend to have broiler prices at least 0.25 cent per pound higher (transportation charges subtracted) than prices in other major markets to which North Carolina processors could ship. Competition from the Delmarva, Shenandoah, and Georgia broiler growing regions tends to be intense in North Carolina's best markets. Maine tends to be a strong competitor in only the New York market.

Washington and several cities in the eastern part of the Great Lakes area tend to be the most attractive of the marginal markets for North Carolina broilers. Although occasional shipments to these cities might be profitable, the long-run outlook for profitable marketing in Detroit

and Cincinnati is discouraging; the latter markets have received large quantities of North Carolina broilers during recent years. With consumption trends continuing as in the past, with the broiler industry in Georgia and Alabama expanding at a relatively faster rate than North Carolina, and with the Shenandoah and Delmarva regions expanding at a relatively slower rate than North Carolina, cities in the Great Lakes area will continue to be disadvantageous markets for North Carolina broilers.

The equilibrium estimates for 1954 were compared with available market data. For the most part, the pattern of interregional broiler shipment is changing with the moving state of equilibrium in the national broiler market. However, the shifts in interregional broiler shipments appear to be lagging behind shifts in the equilibrium pattern of broiler shipments. Also, several instances of deviation between the equilibrium patterns and the actual marketing patterns are interdependent; two or more growing regions would have to change export patterns simultaneously to produce an equilibrium pattern of interregional shipments.

The relative advantages of alternative markets for commercial broilers were obtained for eleven broiler growing regions other than North Carolina.

165 pages. \$2.20. Mic 57-723

STUDIES ON THE CHEMICAL COMPOSITION OF SOIL SOLUTION

(Publication No. 20,416)

Donald James Lisk, Ph.D. Cornell University, 1956

An ultrafiltration method employing specially constructed Lucite ultrafilters has been developed for extracting soil solution. Satisfactory membranes, which are very uniform, are made by impregnating filter paper with an alcohol-ether solution of collodion.

Detailed analytical methods, applicable to analysis of the extracted soil solution, are described for determining phosphorus, calcium, magnesium, potassium, manganese, aluminum, electrical conductivity, and pH.

No significant change in the concentration of ions was found when the soil solution was refiltered through a collodion membrane. The concentration of the ions in the soil extracts did not decrease with time during ultrafiltration.

In a study of the effectiveness of several preservatives and refrigeration for inhibiting microbiological activity in the extracts, chloroform, n-amyl phenol, and 1 percent phenol were found to be satisfactory. Chloroform was chosen as the preservative in all subsequent studies because it could be measured out readily as a liquid.

Calcium and magnesium continued to dissolve with time upon shaking the soil suspensions. The amounts of soluble constituents dissolved in two hours were the same as those dissolved in 72 hours when the suspensions were simply allowed to stand without agitation. A two-hour equilibration period was, therefore, finally adopted. A 1:1 soil:water ratio was selected for preparing the suspensions. This ratio provided a sufficient volume of extract for analytical purposes without sacrificing the accuracy of any of the methods.

A study was made of the effect of different conditions during storage of soils upon the composition of soil extracts. A comparison was made of freezing, air drying, and alternate freezing and thawing of soil during storage. Air drying was the only treatment that significantly affected the composition of the soil extract. The specific conductance and the concentrations of phosphate, calcium, and potassium ions were increased appreciably by air drying.

From the Boltzmann equation, relating the concentration of a given ion as a function of the electric potential, it can be shown that the reduced activity ratio of any pair of cations at any point in the diffuse double layer should be the same as that in the bulk solution. Moreover, this ratio of any pair of ions in the bulk solution should tend to remain constant upon dilution or addition of electrolyte.

The constancy of the reduced cation activity ratios $\frac{(K^+)}{\sqrt{(Ca^{++})}}$,

 $\frac{(K^+)}{\sqrt{(Mg^{++})}}$, $\frac{(Mg^{++})}{(Ca^{++})}$, and $\frac{3\sqrt{(Al^{+3})}}{(H^+)}$ in soil extracts was tested under conditions of increasing and decreasing electrolyte concentration. Deviation from constancy of these reduced ion ratios was attributed to specific adsorption of ions of the same charge and to depletion of ions on the surface of the clay particle.

Plotting the sum of the milliequivalents of Ca⁺⁺, Mg⁺⁺, and K⁺ removed per unit weight of soil against the square root of the water:soil ratio (volume of dilution), yielded a straight line, the slope of which varied with different soils. The initial total amount of soluble salts present in the dry soil was obtained by extrapolation of the line to zero volume of dilution.

The usefulness and the general applicability of the method were demonstrated in the examination of soil solutions from 4 ammoniated soils and 21 representative New York soils that had been heavily fertilized with phosphorus and potassium and cropped with corn. The pH and the concentrations of organic matter, organic phosphorus, and inorganic phosphorus were increased markedly by ammoniation. The correlations of the amounts of phosphate and potassium removed by corn with the concentrations of these two ions in the extracted soil solution were found to be low owing to the heavy initial fertilization of these soils with phosphorus and potassium.

101 pages. \$2.00. Mic 57-724

A STUDY OF THE TEACHING ACTIVITIES OF TEACHERS OF VOCATIONAL AGRICULTURE IN LOUISIANA HIGH SCHOOLS

(Publication No. 17,448)

Anthony Mumphrey, Ph.D. Louisiana State University, 1956

Supervisor: Professor J. C. Floyd

In this study an effort was made by the writer to determine the relative importance of some of the teaching activities of teachers of vocational agriculture in Louisiana High Schools. The author used the normative-survey method of research and the questionnaire technique to secure data used in making this investigation. A questionnaire was directed to 236 teachers of vocational agriculture

presently teaching vocational agriculture in Louisiana High Schools. The opinions rendered by the teachers included in this study are arranged in tabular form, analyzed and supplemented with the findings of other writers in the field of vocational agricultural education.

Other aspects in the program of vocational agriculture ascertained in this investigation are: plan for teaching vocational agriculture; number of teachers of vocational agriculture having organized young farmer classes, organized adult farmer classes and functioning advisory councils; enrollment in vocational agriculture, number of Future Farmer members carried as active members for three years after graduation, number of State Farmers in the Future Farmer Chapter and number of American Farmers presently in the community.

It was revealed by this study that 72 or 49.3 per cent of the teachers of vocational agriculture represented in this study are presently teaching students other than those in vocational agriculture. In addition, 44 or 30.1 per cent of the teachers do not have organized instruction for adult farmers; 62 or 42.5 per cent, do not provide organized instruction for young farmers. Twenty-five or 17.1 per cent of the teachers of vocational agriculture included in this investigation do not have a functioning advisory council

It was concluded in this study that: (1) the teaching schedule provided by local administrators for teachers of vocational agriculture may be a deterrent to the development of a complete program in vocational agriculture; (2) the out-of-school program of teachers of vocational agriculture is seriously lacking in those teaching activities which normally result in functional and systematic instruction for individuals in the young farmer and adult groups; (3) teachers of vocational agriculture plan purposeful teaching activities for launching all-day students in vocational agriculture; (4) teachers of vocational agriculture give most of their attention to the conduct of the all-day program; (5) contests, as a whole, conducted by teachers of vocational agriculture are serving as means to implement desirable changes of behavior in students relevant to the achievement of those ends which serve as anticedents to success in farming; (6) the advisory councils in departments of vocational agriculture are not serving their most useful purposes; and (7) the type and quality of individual, personal services performed by teachers of vocational agriculture, in some instances, are not consistent with the teaching of vocational agriculture on a 214 pages. \$2.80. Mic 57-725 superior merit level.

THE USE OF A VENTURI ATOMIZER IN SPRAY DRIER DESIGN

(Publication No. 18,963)

Verne Howard Townley, Ph.D. University of Minnesota, 1953

The object of the research was to increase the efficiency of spray drying heat labile materials by designing a spray drier which could use high temperature inlet air without damaging the product.

A spray drier has been designed which uses a venturi atomizer to produce a liquid spray and to mix the spray with the drying air. Most of the drying runs were made using an air velocity of approximately 900 feet per second at the throat of the venturi. Air velocities of less than 450 feet per second caused incomplete atomization and deposition of powder on the wall of the diffuser. The use of a diffuser increased the efficiency of the fluid flow so that 15 to 18 inches of water pressure was sufficient to produce the desired air velocity.

The venturi exhausted downward into a drying chamber. The overall effect was to provide immediate and complete mixing of the spray and drying air which then flowed co-currently through the drier to the cyclone separator.

The drier was used to manufacture non fat and whole milk powders at inlet air temperatures up to 535° F. with no deleterious effect on the product. Data are presented to show that the temperature of the inlet air has no effect on the solubility index of the powder if the exit air temperature is held constant. The powder did not contact the drier walls until the final stages of drying which prevented the formation of specks of burned powder.

Condensed milks containing from 24 to 54 per cent solids were dried. The powders dried from milks containing 45 to 54 per cent solids by inlet air at temperatures above 430° F. dispersed very readily without stirring when floated on the surface of water while normal powders did not disperse in this manner.

At a constant exit air temperature, the moisture content of the powder increased with increase in temperature of the inlet air and solids content of the condensed milk. Obviously, it was necessary to increase the rate of milk flow to hold the exit air temperature constant. This caused an increase in the humidity of the air and an increase in the size of the spray particles. A small pneumatic redrier was used to reduce the moisture content of the product to the desired level with no apparent damage to the powder.

The design of the drier is such that it should be possible to construct a commercial drier that would produce a superior product at higher efficiencies.

114 pages. \$2.00. Mic 57-726

THE BIOLOGICAL RELATIONSHIP BETWEEN THE OAK WILT PATHOGEN, ENDOCONIDIOPHORA FAGACEARUM BRETZ, AND THE FUNGI FOUND IN WILTED OAK TREES

(Publication No. 18,964)

Fateh M. Turk, Ph.D. University of Minnesota, 1956

Adviser: J. J. Christensen

The biological relationship between Endoconidiophora fagacearum Bretz. and other fungi invading the wilted red oaks was studied. Wood rotting and many other fungi were isolated from 27 trees that had been dead of oak wilt for one year. Polyporus compactus, Polyporus gilvus, Polyporus tulipiferus, Nummularis bulliardi, Macrophoma spp., Schizophyllum communae and Stereum versicolor were the most commonly isolated fungi. Armillaria mellea, Polyporus versicolor and Stereum gausapatum were primarily found in the roots and butts of wilted trees. There apparently was no difference in the kind of fungi invading wilted

trees, regardless of whether the trees were left standing, felled or treated with pentachlorophenol.

A total of 28 different species of fungi were isolated from 150 red oaks, which had been dead for 1 to 4 years. None of these trees yielded E. fagacearum. In these trees, there was no real difference in the kinds of fungi isolated at 4 1/2 feet and 6 inches above the ground. The sapwood of trees which had been dead for 15 to 48 months was decayed. The decay had progressed from the sapwood into the heartwood in trees that had been dead for 24 months or longer. When trees that wilted at the same time were compared, decay was more advanced in trees that had a higher moisture content. Trees on which more bark remained had more decay than trees with less bark.

All of the trees which had been dead for 36 months or longer were infected with Polyporus gilvus. Armillaria mellea was the chief cause of root rot and basal decay in oaks. Polyporus versicolor and Stereum versicolor were found fruiting at the base while Polyporus tulipiferus was causing decay in upper portions of the stem of wilted trees.

It was found that the oak wilt fungus could survive for 10 months in wilted, felled or standing trees. It survived longer at the base than at the top of wilted trees. Endoconidiophora fagacearum was never isolated from trees that had a moisture content less than 35 per cent. Wilted trees heavily infected with Nummularia bulliardi did not yield the oak wilt fungus even when the moisture content of the wood was above 40 per cent.

The oak wilt fungus was found to survive in wood blocks, cut from infected trees, for more than 32 days when stored at 3°C and for less than 24 hours at 35°C.

Thirty-one fungi were tested for their antibiotic effect on E. fagacearum. Eight fungi indicated that they were inhibitory and were tested more extensively. Trichothecium roseum inhibited the mycelial growth of E. fagacearum in culture and the young hyphae of E. fagacearum were distorted by it. The ascospores and endoconidia of E. fagacearum were unable to germinate when placed in a filtrate which had been extracted from T. roseum and diluted to concentrations as low as 3 ml. of extract to 100 ml. of distilled sterilized water. Perithecial formation of E. fagacearum with filtered extract or spores of T. roseum. The greatest concentration of antibiotic substances apparently were produced by T. roseum when it was incubated in liquid malt, at 28° C, for 3 weeks.

Nummularia bulliardi was found to inactivate E. fagacearum when it overran the latter in petri plates. Small red oaks inoculated with E. fagacearum cultures which had been overrun by N. bulliardi did not become infected with E. fagacearum.

52 pages. \$2.00. Mic 57-727

EFFECTS OF STORAGE METHODS UPON NUTRIENT LOSSES AND FEEDING VALUE OF ENSILED LEGUME AND GRASS FORAGE

(Publication No. 20,431)

Leland Stanley Wittwer, Ph.D. Cornell University, 1956

The effects of storage methods upon the nutrient losses that occurred when mixtures of legumes and grasses were

ensiled by 4 different methods, and the feeding value of the silages, were studied over a 2-year period. The treatments were: (1) red clover and mixed grasses ensiled without wilting; (2) red clover and mixed grasses wilted to contain 25 to 30 per cent dry matter; (3) red clover and mixed grasses ensiled without wilting but to which 200 pounds of dry chopped hay were added to each ton of green forage at time of storage; and (4) a mixture of birdsfoot trefoil and other legumes and grasses ensiled without wilting.

The clover and grass mixtures were harvested from the same field and ensiled June 8 to 12. The birdsfoot trefoil mixture was ensiled 18 days later. At time of storage the dry matter content of the unwilted clover was 17.6 per cent in 1954 and 23.2 per cent in 1955. The birdsfoot trefoil mixture contained 20 per cent dry matter in 1954 and 30 per cent in the following year. The forages were stored in 10 x 30-foot wooden stave tower silos.

The juice runoff and fermentation losses, expressed as a percentage of the total dry matter ensiled, for the unwilted clover, wilted clover, clover to which dry chopped hay was added, and birdsfoot trefoil were 17.9, 10.5, 14.4, and 15.3, respectively, in 1954-55 and 19.3, 10.0, 10.5, and 6.6, respectively, in 1955-56. Wilting the clover and grass mixture showed a significant advantage over not wilting in reducing juice losses from 8.7 to 2.9 per cent in 1954-55 and from 7.6 to 0.1 per cent in 1955-56.

When compared with the treatment in which wilted clover was ensiled, the addition of dry hay did not reduce juice losses sufficiently to warrant its use. Also, the hay was ineffective in reduction of fermentation losses and was inconvenient to handle.

Losses from surface spoilage ranged from 4.7 to 9.3 per cent in 1954-55 and from 6.7 to 11.3 in 1955-56. Since the silos were relatively small, these losses appear high when calculated as a percentage of the total dry matter ensiled. Surface spoilage might have been greatly reduced by capping the silos with wet forage or by use of one of the silo caps now on the market.

All 4 of the silages were of excellent quality as judged by appearance, odor, keeping qualities, pH, carotene content, lactic and volatile acid content, and digestibility of dry matter. All of the silages had an average butyric acid content of less than 2 per cent.

The nutritive value of the silages was measured by use of 32 cows separated into 8 groups of 4 cows each. Each of the 4 silages was fed as the only roughage to each cow for a period of 5 weeks in a Latin square feeding trial which extended over a period of 20 weeks. Differences in 4 per cent fat-corrected milk production, roughage drymatter consumption, and body weight changes were not statistically significant at the 5 per cent level. The feed consumption and milk production data given as an average of all 4 treatments in pounds daily are as follows: silage, 105.6; silage dry matter, 27.3; grain, 11.4; 4 per cent fat-corrected milk, 43.5; and body weight gains, 0.44.

The results of this experiment agree with previous research conducted at Cornell and at many other stations, which have shown that when forages such as clovers and grasses are harvested at the same date, and otherwise good harvest methods are used, the forages are of equal nutritive value.

In the evaluation of storage methods to use when forage crops are ensiled, this experiment has shown a significant advantage for wiiting the forage to a dry-matter content of 25 to 30 per cent. Wilting the forage before it was ensiled resulted in a significant saving of nutrients during the storage period, and avoided the offensive odors that result from excessive juice runoff. Since the wilting method is less simple in practice than when forages are harvested without wilting by use of the direct-cut field chopper, the method to use will depend upon economic factors and labor and machinery available on the individual farm.

75 pages. \$2.00. Mic 57-728

AGRICULTURE, ANIMAL CULTURE

DIETARY FACTORS AFFECTING GROWTH OF CHICKS AND TURKEY POULTS

(Publication No. 20,223)

Bobby Dale Barnett, Ph.D. The University of Wisconsin, 1957

Supervisors: Professors H. R. Bird and F. M. Strong

The presence of unknown growth factors for chicks in certain feed-stuffs has been demonstrated. Response to these factors is irregular and at times may disappear completely in a given environment. It was found that contamination of the purified diet of experimental birds with feces from older birds resulted in reduced basal growth and constant responses of considerable magnitude. The addition of high levels of chlortetracycline reduced responses to unknown factors. It was concluded that certain intestinal microorganisms were necessary for maximum responses and certain environmental conditions were detrimental to their propagation. Depletion of the dams also increased the magnitude of response of their progeny.

Of a number of supplements tested fish solubles and dried whey were selected for further study because of their high potency and ready availability. Samples of these materials ashed in a muffle furnace at 525° C and fed at a rate equivalent to 5% of the untreated supplements contained no measurable activity.

Pure organic compounds suspected of having growth promoting ability were assayed for activity. DL-tryptophan, orotic acid and lipoic acid did not consistently stimulate growth. It was concluded that the activity of fish solubles and dried whey was not due to their content of these substances. A concentrate prepared from penicillin fermentation residue stated to be highly active by chick assay and microbiological assay was fractionated. A colleague isolated a quantity of crystalline material from this concentrate and identified it as adenosine. Adenosine was inactive by microbiological assay but active by chick assay. Levels of 150 and 300 mg/kg of ration caused significant growth responses. No consistent growth responses to adenosine occurred in the presence of fish solubles or dried whey. It was suggested that part of the growth response of these materials might be due to their content of adenosine or similar compounds.

Experiments designed to study the optimum levels of adenosine and the role of similar compounds in the nutrition of depleted chicks were inconclusive because of

excessive mortality. This mortality was reduced or eliminated by feeding aureomycin or a combination of dried whey and fish solubles or by use of a practical diet. Increasing the level of vitamins, minerals or certain amino acids did not affect viability.

Lathyrism, a paralytic condition in man associated with diets high in lathyrus pea seeds, has been known for many years. The rat is unaffected by the species of Lathyrus causing human lathyrism namely Lathyrus sativus, L. cicera and L. clymenum but develops skeletal deformities, hernias, dissecting aortic aneurysms and other abnormalities when fed seeds of L. odoratus. The dissecting aneurysm of the aorta observed in rats consuming L. odoratus seeds or beta-aminopropionitrile (BAPN), the active fragment of the naturally occurring toxin, bears a striking resemblance to a widespread condition occurring in turkeys grown commercially. Experiments were conducted to study the possibility of a relationship between BAPN toxicity and the field cases of dissecting aneurysm in turkeys.

BAPN at 0.25% of the diet caused severe symptoms in rats when fed for several weeks. Turkey poults were fed a practical diet containing this level and 0.125%. Severe paralysis, retarded growth and degeneration of the anterior motor neurons occurred in less than 1 week. At levels of 0.0625, 0.04 and 0.03% retarded growth, severe leg and toe deformities, pericardial and pulmonary hemorrhages, and dissecting aneurysms of the aorta were observed. At 0.02 and 0.01% retarded growth and leg deformities were the only symptoms observed to 5 weeks. Although it was impossible to determine whether BAPN is a causative agent in field cases of dissecting aneurysms and leg deformities of turkeys, the evidence obtained suggests that this could be the case.

89 pages. \$2.00. Mic 57-729

A STUDY OF DIGESTION OF CELLULOSE AND DRY MATTER USING "IN VIVO" AND "IN VITRO" RUMEN TECHNIQUES

(Publication No. 20,172)

James Lee Cason, Ph.D. North Carolina State College, 1956

Supervisors: John William Pou and Walter Earl Thomas

The three techniques (fistulated cow, artificial rumen, and silk bag) were carried out simultaneously and observations were taken at six hour intervals over a twenty-four hour period. Six rumen fistulated cows were used to study the time of day, phosphorus and iron effects upon the disappearance of dry matter and cellulose of a poor quality hay from the rumina (reticulo-rumina) and to supply the rumen liquid used in the preparation of artificial rumina. Silk bags containing samples of the poor quality hay were suspended in the rumina of the fistulated cows.

The treatments consisted of three levels each of iron and phosphorus supplementation in all possible combinations, making a total of nine treatments. A balanced incomplete block design with four replications was carried out over six periods.

The average percent dry matter disappearance per twelve hour interval, based upon the initial amount present, was 103.0, 22.3 and 26.4 percent from the rumina, silk bags and artificial rumina, respectively. The average cellulose disappearance, on the same basis, was 99.1, 9.2 and 12.5 percent from the rumina, silk bags and artificial rumina, respectively.

The addition of phosphorus to the diet caused a significant increase in the amount of phosphorus present in the rumina and artificial rumina, whereas, the iron supplementation had no effect upon the iron present in the rumina and artificial rumina.

The day matter and cellulose disappearance from the rumina, artificial rumina, and silk bags suspended in the rumina in general was not affected by iron and phosphorus supplementation in this study.

There was no time of day effect upon the presence of phosphorus in the rumina and artificial rumina. The iron content in the rumina was higher (highly significant) during the day observations while it was higher (significant) during the night observations in the artificial rumina.

A highly significant effect of time of day upon dry matter disappearance from the three techniques used, largely attributable to more disappearance during the first six hours following feeding, was noted.

Time of day had a significant effect upon cellulose disappearance from the artificial rumina and a highly significant effect upon cellulose disappearance from the rumina and silk bags. In the rumina and artificial rumina the amount of cellulose disappearance was greatest (highly significant) at the first six hours following feeding, whereas, it was greatest during the second six hour interval following feeding from the silk bags.

In general, the disappearance of dry matter and cellulose from the rumina, silk bags and artificial rumina was not correlated when based upon cow means or within cow means, although the disappearance based upon within cow means tended to follow a more consistent pattern.

A definite correlation trend (highly significant) over the three techniques for the disappearance of dry matter at time-of-day intervals and an overall basis was observed. The cellulose disappearance did not follow the above trend for all three techniques. 66 pages. \$2.00. Mic 57-730

THE INTERACTION OF BREEDING AND LEVELS OF NUTRITION IN SWINE (DIFFERENT CROSSES OF INBREDS SUBJECTED TO VARIED LEVELS OF FEEDING A BALANCED RATION)

(Publication No. 19,197)

Clarence Lorraine Cole, Ph.D. University of Minnesota, 1956

Adviser: L. M. Winters

During 1954-55 96 Minnesota 2 X Minnesota 1 cross-breds were fed in 8 lots: full fed; 95 percent, 94 percent, 87 percent, and 82 percent of full feeding; self-fed with 3 mg. Methyltestosterone; self-fed with 3 mg. Diethylstilbestrol; and self-fed with 3 mg. of each hormone per pig daily. During 1955-56 230 pigs were fed in 23 lots. Five crosses--Minnesota 2 X Minnesota 1, Minnesota 3 X Minnesota 1, Yorkshire X Minnesota 1, Yorkshire X Minnesota 2 X Minnesota 2 X Minnesota 1, and Minnesota 3 X Minnesota 2 X Minnesota 1--were fed under 7 nutritional treatments: 5

lots self-fed; 3 lots each restricted to 85 percent, 78 percent, and 71 percent of full feeding; and 3 lots each self-fed the basal ration diluted with 10, 20, and 30 percent by volume of ground corncobs.

The 1954-55 trials showed the Minnesota 2 X Minnesota 1 crossbred produced a 200-pound hog in 140 to 150 days under all the feeding regimes. Carcass length was over 30 inches, carcass fat was 40 to 45 percent, and carcass lean 40 to 44 percent for all lots. Average backfat thickness ranged from 1.3 inches to 1.5 inches for all lots except the 82 percent restricted at 1.23 inches.

The feeding of Methyltestosterone, Diethylstibestrol, and a combination of the two tended to decrease backfat thickness and carcass fat and to increase carcass lean. It did not affect rate of gain, feed utilization, or carcass length. Limited feeding at 87 and 82 percent of full feeding increased feed efficiency and produced leaner carcasses than full feeding.

The 1955-56 trials showed: highly significant differences for both crosses and treatments for average backfat thickness, estimated carcass fat, estimated carcass lean, age at 200 pounds, and 140-day weight; highly significant differences for treatment for rate of gain and dressing percentage; and highly significant differences for crosses for carcass length.

Restricted feeding reduced 140-day weight, daily gain, dressing percentage, and carcass firmness in direct proportion to restriction. Pounds of feed per 100 pounds gain, average backfat thickness, and carcass fat were reduced almost to the same level at 85 and 78 percent of full feeding and showed a further reduction at 71 percent of full feeding. Carcass lean was increased in the same proportion that fat was decreased. Carcass length was not affected by restricted feeding. Eighty-five percent and 78 percent of full feeding produced desirable carcasses from all crosses. Seventy-one percent restriction produced carcasses that had too little fat, although feed efficiency was highest at this feeding level.

Dilution with 10, 20, and 30 percent corncobs reduced feed intake to approximately 95 percent of full feeding regardless of rate of dilution. Dilution with corncobs did not affect rate of growth or length of carcass. There was a tendency for less carcass fat, less average backfat thickness, and more lean with ration dilution.

There were cross differences in carcass length, backfat thickness, carcass fat, carcass lean, age at 200 pounds, and 140-day weight. Crosses responded differently to different nutritional treatments. Generally those crosses tending to be too fat on full feeding responded best to restricted feeding.

The data show that the animal breeder can produce whatever type of carcass he wants by controlling the breeding and feeding. It is his responsibility to recombine genes for economic factors of production into lines of value to the producer and consumer.

137 pages. \$2.00. Mic 57-731

THE EFFECT OF PROTEIN QUALITY AND SUPPLEMENTATION OF SWINE RATIONS WITH LYSINE AND TRYPTOPHAN UPON NITROGEN METABOLISM, GROWTH AND CARCASS COMPOSITION OF SWINE

(Publication No. 20,249)

Donald Harris Kropf, Ph.D. The University of Wisconsin, 1957

Supervisors: Professor Robert W. Bray and Professor Paul H. Phillips

Consumer demand for leaner pork cuts and less fat has made it imperative to develop management and feeding practices which will result in greater lean muscle development in swine. Improving amino acid balance of rations, either by addition of crystalline amino acids or by use of "high quality proteins" was tested to determine its effect on swine carcass merit.

Addition of either crystalline lysine or tryptophan did not prove beneficial to growth rate. Reduced feed intake was observed on lysine supplemented rations. Nitrogen metabolism was not affected by use of the crystalline amino acids, but a 20% protein ration caused increased digestibility and greater nitrogen retention. Addition of either lysine or tryptophan did not affect organ weights, carcass physical measurements, yields of wholesale cuts or chemical composition of carcass or liver samples, except possibly during early growth stages. Nitrogen retention increased with body weight or age and was closely and positively related to the carcass moisture and protein content; but inversely related to carcass ether extract.

Various combinations of protein from poor and good quality sources, of two levels of protein (12% and 16%); with or without aureomycin were tested. The 12% protein ration was reduced to 11 and 10% respectively, at 70 lbs. and 125 lbs. live weight and the 16% level was reduced to 14 and 12% at the same live weights. Growth was favored by the high level of the good quality protein. No consistent effect was observed upon slaughter data, fat back thickness, specific gravity and yields of various cuts. Liver protein was increased when the high level-high quality protein was ingested. Carcass protein content tended to be directly related to quantity and quality of dietary protein, whereas fat content was inversely related.

In the final experiment, a 16% good quality protein, a 16% poor quality protein and a 12% good quality protein were used. Six pigs were slaughtered at 45 lbs. to give an indication of initial carcass composition, whereas 7 pigs from each of the treatment groups were slaughtered at each of the following weights: 85 lbs., 145 lbs. and 205 lbs.

Protein quality affected growth rate, feed intake and feed utilization. Liver and kidney weights were greater and leaf fat weight less at early stages of growth in pigs fed the 16% good protein ration. These differences became non-existent at 205 lbs. live weight.

Eye muscle area was directly related to protein level and quality, but the effect on fat back was evidenced statistically only on the average of three measurements at the first rib, last rib and last lumbar vertebra. Specific gravity was increased as amino acid balance of the ration was improved.

Development of lean tissue was greater in gilts than in barrows. Lean cut yields and protein content of the carcass

composite, Longissimus dorsi, ham-lean and blade end of the loin samples were increased by use of the 16% good quality protein ration, whereas fat content of the same samples was decreased.

Development of the head plus jowl, liver, kidneys, viscera and lean cuts was accentuated in early stages of growth. Adipose tissue tends to develop later in the growing-fattening period. Development of intermuscular and intramuscular fat seems to change little after 145 lbs. live weight.

Specific gravity is strongly associated with carcass moisture, fat and protein. Specific gravity of the whole ham or loin blade sample serves as an excellent indicator of carcass specific gravity.

The chemical composition of the loin blade sample was more closely related to carcass composition than that of the Longissimus dorsi or ham-lean.

178 pages. \$2.35. Mic 57-732

INFLUENCE OF DIET ON KETOSIS IN SHEEP

(Publication No. 19,430)

James Burton Outhouse, Ph.D. Purdue University, 1956

Major Professor: W. M. Beeson

Ketosis in sheep is believed to be a metabolic disorder resulting from a hypoglycemia during the latter stages of pregnancy. Many investigators believe it is caused by inadequate diets during the period when the demands of the fetus are the greatest. It is characterized by a low blood glucose level and a higher than normal blood ketone level and is associated with multiple pregnancies in the ewes. It is usually fatal and may cause severe economic loss if it develops more than a week prior to parturition. Affected ewes recover rapidly after lambing or aborting.

An attempt was made over a two-year period to produce ketosis experimentally during the last month of gestation in 110 black-faced western ewes. These ewes were subjected to many of the adverse dietary conditions reported in the literature to be contributing causes of ketosis.

In the first trial, 44 ewes were fed to overfatness during the first four months of gestation on diets furnishing 130 per cent of their requirements of total digestible nutrients. During the last month of gestation, 3 lots of these ewes were allowed to consume from 30 to 50 per cent of their requirements of total digestible nutrients. Since obesity has been shown by some investigators to be a predisposing cause of ketosis, the reduction in the energy levels of the diet should have caused the ewes to catabolize excessive amounts of fat, and thus raise the level of ketone bodies in the blood. While there was a marked reduction in the weights of the ewes, no cases of ketosis developed. Blood analyses revealed a significant decrease in blood glucose levels in the ewes on the reduced rations when compared to one lot of ewes which remained on the 130 per cent energy level, but this was not of sufficient magnitude to cause ketosis. There was no significant increase in blood ketone levels. Three pregnant ewes placed on a complete fast for a five day period, failed to develop ketosis even with a significant drop in blood glucose levels and

with blood ketone levels approaching those observed in clinical cases of ketosis.

During the second trial, 66 ewes were fed during the entire gestation period on low energy rations consisting of ground corn cobs or grass silage to determine the effect of inadequate diets on the development of ketosis. Grass silage is considered a ketogenic feed for dairy cows, but its effect on the blood ketone levels of pregnant ewes has not been determined. Two lots of ewes were deprived of salt and mineral supplement and two others, one on corn cobs and one on grass silage, were limited to 30 per cent of their TDN requirements. While there was some change in blood glucose and blood ketone levels, no evidence of hypoglycemia or ketonemia was apparent as a result of any of the treatments. Grass silage did not prove to be ketogenic.

It has been suggested by some investigators that ketosis in dairy cattle may be caused by a relative pituitary-adrenal cortical insufficiency. The lower blood eosinophil levels observed in both trials is evidence of increased pituitary-adrenal activity, but no insufficiency could be detected even in cases of spontaneous ketosis observed in the field, from which blood samples were obtained.

During the second trial insulin was injected subcutaneously in a limited number of ewes on the grass silage ration in an attempt to produce a hypoglycemia of less than 20 milligrams per 100 milliliters of blood. It was impossible to maintain a constant hypoglycemia and the general effect was to increase rather than reduce the blood glucose levels. For this reason blood ketone levels were not significantly elevated, but blood eosinophil levels indicated that stress was increased.

The weight of the fetus appeared to have a greater effect upon blood levels than the number of pregnancies, but pregnant ewes showed a greater reduction in weight and in gains and a greater change in the blood levels of glucose, ketones and eosinophils than non-pregnant ewes on inadequate diets.

Since no cases of ketosis were produced in either trial, the effect of the various treatments on the development of ketosis is difficult to evaluate. The data would indicate that the diet appears to be only one of a number of factors involved.

207 pages. \$2.70. Mic 57-733

A STUDY OF THE FACTORS AFFECTING THE NUTRITIVE VALUE OF OAT SILAGE AS A FEED FOR BEEF CATTLE

(Publication No. 19,873)

Donald Lafayette Staheli, Ph.D. University of Illinois, 1956

A series of experiments were conducted to study: (1) Some agronomic cultural and management practices which might affect yields, plant composition, and quality of oat silage; (2) The value of oat silage as a roughage for wintering and fattening beef cattle; (3) Various supplementary practices which might result in increased performance by beef cattle being fed oat silage.

A field plot trial was conducted to study the effect of three varieties (Branch, Clintland, and Nemaha), three nitrogen treatments (0, 30, and 60 pounds per acre), and two seeding rates (2 and 4 bushels per acre) upon oat silage yields and plant composition. The following statements summarize the findings. (1) The only treatment affecting dry matter production was variety in which case Nemaha showed a significantly lower (P less 0.01) yield of dry matter. (2) The Branch variety yielded a significantly taller plant (P less 0.01) which showed a significant trend (P less 0.01) toward lodging. The four-bushel rate of seeding also significantly promoted lodging (P less 0.01). (3) Concerning plant composition, Nemaha yielded a significantly higher protein content (P less 0.01) than any of the other treatments. (4) The oat grain yield was significantly higher (P less 0.01) for the Clintland variety and for the two-bushel seeding rate. The application of sixty pounds of nitrogen per acre significantly decreased (P less 0.05) grain yield. The interaction between sixty pounds of nitrogen and the Branch variety and between sixty pounds of nitrogen and the four-bushel seeding rate, each caused a significant decrease (P less 0.01) in grain yield.

Another experiment was designed to determine the proper stage of maturity for cutting oats for silage. The results revealed that the most optimum combination of digestible nutrients, carotene, and dry matter yield necessary for high quality silage, is found when the oats are in the very early to medium dough stage (26 to 33 percent dry matter).

Feed lot comparisons between oat silage and legumegrass silage showed that both silages have approximately the same value as a roughage for wintering calves or fattening yearling steers.

The results of three experiments conducted in three consecutive years demonstrated that a full-feed of oat silage, 3 to 4 pounds of shelled corn, and two pounds of legume hay is a satisfactory ration for wintering beef calves. The gains obtained in these three trials averaged 1.43 pounds per head daily. When these calf gains were valued at \$20.00 per hundredweight and when the cost of supplemental feed required to make these gains was deducted, the average return per acre of oat silage harvested over the three-year period was \$128.13. This return was at least 300 percent greater than what would have been realized had the oats been harvested for grain.

Attempts to improve the nutritive value of oat silage by various supplementary practices can be summarized as follows. (1) The addition of two pounds of legume hay to a heavy silage ration resulted in a slight improvement in performance. A later trial, however, showed that two pounds of oat straw fed with heavy silage rations gave results comparable to those obtained from feeding a similar amount of alfalfa hay. (2) The addition of one pound of a protein supplement to an oat ailage wintering ration resulted in a significant increase in gain when poor quality oat silage was fed. Conversely, no significant increase in gain was noted from protein supplementation when high quality oat silage was used. (3) Supplementing oat silage wintering calf rations with vitamins A and D gave no significant increase in gain or blood plasma vitamin A levels.

In a series of digestion trials, the addition of two pounds of alfalfa hay or its equivalent in the form of protein, energy, or ash, to a full-feed of oat silage, failed to significantly improve the digestibility of oat silage.

From the results of these supplementation studies, it was concluded that energy is the only major limiting constituent in a ration consisting of good quality oat silage and a calcium-phosphorus mineral mix.

174 pages. \$2.30. Mic 57-734

AGRICULTURE, ANIMAL NUTRITION

THE INFLUENCE OF ENVIRONMENTAL CONDITIONS
AND BOTANICAL COMPOSITION UPON THE
NUTRITIVE VALUE OF ROTATIONALLY
GRAZED PASTURE FORAGES

(Publication No. 20,428)

Albert Matthews Smith, Ph.D. Cornell University, 1956

The influence of seasonal variability upon the digestibility of pasture herbage available over two grazing seasons was examined and it was found that high temperatures and a lack of rainfall had a marked depressing effect. It is apparent that the amount of rainfall is of paramount importance for the production of pasture herbage of high nutritional value and that plant species is relatively unimportant when rainfall is adequate. This need for moisture is at least indicative of a possible role of irrigation in pasture production, especially in the later stages of the grazing season and during periods of extended drought.

Pastures consisting of mixtures of Alfalfa, Ladino clover, and Bromegrass; Ladino clover and Orchardgrass; and Kentucky bluegrass and Wild white clover were compared with respect to their productive capacity when managed under a rotational grazing procedure in which an adequate supply of herbage was always available. The intake of digestible dry matter of all treatment groups was similar and appeared to be influenced primarily by the digestibility of herbage available. This seems to indicate that the intake of dry matter is limited by some physiological or anatomical factor and the amount of nutrients available is determined by the digestibility of the herbage consumed. The Ladino clover - Orchardgrass mixture, which had a consistently higher digestibility, appeared superior to either the Alfalfa, Ladino clover, Bromegrass mixture or the Permanent mixture of Kentucky bluegrass and Wild white clover. The amount of milk produced appeared to be the most sensitive indicator of the amount of digestible dry matter consumed. Irrespective of the pasture treatment every increase or decrease in intake of digestible dry matter resulted in a corresponding increase or decrease in milk production.

In an effort to determine how the consumption of pasture herbage by grazing dairy cattle is related to their level of milk production, their body weight, and to changes in body weight, the data for two grazing seasons were analyzed by partial regression analysis. It was found that there was an apparent increase in the efficiency of milk production and change in body weight that is of such a magnitude as to indicate that the statistical method includes in the factor for maintenance some of the nutrients that should be used for productive purposes. It is, however, evident that included in maintenance is an energy cost of grazing that is apparently much higher than has previously been proposed. The cost of maintenance of grazing cows is approximately 250 per cent of that of barn confined cows. When the allowance for maintenance was calculated on the basis of the caloric value for productive work as represented by present day standards, the allowance for maintenance was only about 5-10 per cent lower than the allowance as determined by the partial regression method. This difference is well within the normally expected variation of biological work.

93 pages. \$2.00. Mic 57-735

AGRICULTURE, FORESTRY AND WILD LIFE

THE SPECTROCHEMICAL ANALYSIS OF ABIES GRANDIS (DOUGL.) LINDL. WITH PARTICULAR REFERENCE TO DECAY BY ECHINODONTIUM TINCTORIUM (ELLIS) E. AND E.

(Publication No. 20,376)

Everett Lincoln Ellis, Ph.D. University of Washington, 1956

The Indian paint fungus, Echinodontium tinctorium, virtually unknown west of the Cascades,* is the most serious cause of decay in grand fir, Abies grandis, east of these mountains. Large areas and volumes of grand fir timber are rendered almost worthless from decay which is apparently more serious in localized areas and on basaltic soils.

Recent advances in mineral nutrition and biogeochemistry suggested the desirability of knowledge of the composition and content of mineral elements in grand fir. Collections were made from 113 trees in the major range of the species. Selected samples were analyzed for the elements Ca, Mg, K, and Na by flame spectrophotometry and for thirty-three other elements spectrographically. More than one hundred analyses were made and included buttwood, rotten wood, conks of Echinodontium tinctorium, bark, needles, seed, and lichens.

Analytical procedure involved the direct-current arcing of ash in purified graphite electrodes on a Jarrell-Ash 21-foot grating spectrograph. Three arcings, twenty seconds, one minute, and three minutes, were made of each sample, photographing the range of about 2200 to 4800A on Spectrum Analysis No.1 plates. After development, spectra were examined and line intensities estimated and compared with intensities of standards prepared from highly-purified "Specpure" reagent salts to provide semi- quantitative data for the elements detected.

Spectrographic analyses are presented in a series of tables giving parts per million of elements in terms of ash and of oven-dry weight. Elements were classified as essential - B, Mn, Fe, Mo, Cu, Zn; other common elements - Ag, Al, Ba, Co, Cr, Ni, Pb, Rb, Sr, Ti; and uncommon elements - Au, Ga, In, La, Li, Sn, V, and Zr. The elements C, H, O, N, S, Cl, Se, Br, I, and F were not determined; elements sought but not found included As, Cb, Cs, Hg, Pt, Sb, Ta, Be, Ge, Pd, Tl, and perhaps Cd and Bi. Where an element is reported as missing, it may occur merely below detection limits for that element.

Mean values, standard deviations, standard errors of means, and significance of differences in means are presented for three groups of data: buttwood ash components and physical data for 26 trees west of the Cascades and 34 east of the Cascades; buttwood ash components and physical data for sixteen trees east of the Cascades - eight each on basaltic and granitic parent soils (often with loess); and nine samples of rotten wood ash and eight matched sound wood ash from trees east of the Cascades decayed by the Indian paint fungus. Other individual values, means, and statistical information are presented for other grand fir tissues. Results generally agree closely with published data in amounts and composition of ash. A number of comparisons also are drawn between individual trees grown

on different soils, tress of different age and conditions of decay, and different tissues.

Major conclusions are as follows:

- 1. Significant differences are shown in mean values of elements in buttwood ash of trees grown west and east of the Cascades.
- 2. Few differences were established for elements detected in buttwood ash of trees grown on different parent soils within a given area.
- 3. Decay by Echinodontium tinctorium results in increased ash content and subsequently higher amounts of elements found. Conks apparently have an ability to concentrate or accumulate certain elements selectively, as indicated by higher levels of eleven elements in ash of conks as contrasted to rotten wood.
- 4. Different tissues of grand fir show highly variable composition; needles generally show the highest amounts, followed in order by bark, conks of the fungus, rotten wood, and sound wood. Specialized tissues such as seed and seed scales show anomalous quantities of certain elements.

Methods and results described should have potentially valuable application in many fields of investigation in forestry and related sciences. 106 pages. \$2.00. Mic 57-736

*The Cascades are located primarily in western Wash-ington and Oregon.

AN EVALUATION OF CONIFER PLANTATIONS AS WILDLIFE HABITAT

(Publication No. 20,025)

Robert Leo Smith, Ph.D. Cornell University, 1956

The purpose of this study was to determine the effect of reforestation on wildlife and to arrive at some basic management practices that could further develop wildlife use of plantations. Observations were also made on the occurrence of earthworms on reforested and non-reforested areas.

Methods: - Sixty plantations, involving 10 species of conifers in pure and mixed plantings, and including various height and age classes, different acreages and a variety of edge conditions were selected. They were located on public and private lands within a 15-mile radius of Ithaca, New York. All plantations were cover-mapped; data on planting, survival, openings and edge conditions were recorded. The areas were visited on foot during all seasons to ascertain comparative game use of various plantations. Bird surveys were conducted in 30 plantations during May and June, 1955 and 1956. Small mammal populations were sampled by use of snap traps set out in grids 50 feet apart. Earthworm populations were sampled in randomly selected plots, one yard square, within each study area. The worms were obtained by use of potassium permanganate solution and by digging. The pH, amount of calcium and organic matter were determined for each sample plot.

Results: - A succession of wildlife, associated with increasing height occurs in artificially reforested areas.

Preferences of different wildlife species for certain conifers and the growth behavior of various trees influences the wildlife use of plantations, especially in heights beyond 12 feet. Deer showed a strong preference for pine in winter, but in summer they frequented all plantations. Since the lower limbs of spruce were buried under several feet of snow, creating tent-like shelters beneath the trees, spruces proved the most effective winter cover for rabbits and grouse. The bird survey indicated that spruce and mixed plantings containing spruce had the highest density and variety of birds and pines the lowest. The variation in the growth habits and growth rates of the different conifers provided a variety of habitat situations, nesting sites and singing perches. The abundance of small mammals in plantations over 20 feet tall was influenced by ground cover conditions.

The distributions and abundance of wildlife in a plantation is influenced by the area, nature of the edge, presence, size and abundance of openings and the management practice applied to the plantations. Plantations over 10 acres, hold a greater variety and higher population density than smaller plantations. The use of smaller plantings is dependent upon adjacent cover. The cover value of most plantations is severly reduced by thinning and pruning.

Management suggestion based on the finding in this study are discussed.

Chi-square tests of the deviations of both numbers and weights of earthworms from their means indicated a heterogenous populations in all study areas. This variability was partly associated with differences in organic matter, cover and moisture conditions. Old field plots with or near woody growth had a significantly greater population than sod plots. A pine plantation on medium lime soil contained an average of 19 earthworms per plot, as contrasted with 8.5 per plot in the old field habitat and 0.2 per plot in a pine plantation on lime soil.

Conclusions:- The wildlife potential of conifer plantations depends on a great number of variables, including site, coniferous species, height, size, openings and management. Plantations over 10 acres have created favorable habitat for certain species of wildlife in areas where no habitat for them existed before. In these, survival failures and cover interspersion provided by mixed stands have developed conditions favorable to many game and nongame species. The diameter of large plantations is of little significance as long as openings occur within them.

245 pages. \$3.20. Mic 57-737

THE ESTIMATION OF FOREST MANAGEMENT INVENTORY DATA FROM AERIAL PHOTOGRAPHIC MEASUREMENTS

(Publication No. 19,221)

James Wesley Willingham, Ph.D. University of Minnesota, 1956

The purpose of this study was to establish a method by which more detailed information concerning forest stands

could be obtained from vertical aerial photographs. This was accomplished by a study of the relationships existing between two distinct categories of forest stand variables. The two categories were: those that can be measured directly on aerial photographs, such as crown diameter or tree height, and those that cannot be seen, such as age or growth rate. The relationships so established were then used to make estimates of the variables that could not be seen, from the variables that could be measured.

Sixty-five, one-tenth acre, sample plots were established in an effort to determine the existing relationships. These plots were located in longleaf pine stands (Pinus palustris Mill.) on the Austin Cary Memorial Forest in Alachua County, Florida. Information was collected on fourteen stand variables on these sample plots.

Four stand variables were discontinued in the collection of the field data. Two additional variables were eliminated from further study in the subsequent analysis of bivariate relationships. Of the eight remaining variables, four were of the type that could be measured directly on aerial photographs and in further analysis were considered to be the independent variables. Four were of the type that could not be seen and were considered to be the dependent variables.

Each of the dependent variables was then analyzed to determine its relationship to each of the four independent variables. An analysis was first made to determine the linear relationships and then to determine the curvilinear relationships. No significant difference was found between the linear and curvilinear relationships.

A formula was then derived for each of the relationships and the expected error of estimate of the dependent variable was computed. The formula for the expected value of each dependent value is shown below:

Radial Growth = +1.07 - 0.0111(tree height) - 0.00381 (crown density)

Age = -15.0 + 0.78(tree height) + 0.11(crown density)

Diameter Breast Height = +0.6 + 0.2981(crown diameter) + 0.0843(tree height) - 0.0331 (number of trees)

Cubic Volume = -114.0 + 1.111(crown density) + 3.030 (tree height) + 2.375(number of trees)

The number of one-tenth acre photographic sample plots required to make estimates of the dependent variable with ±10 per cent of the actual value was determined as a final measure of the usefulness of this method. The number of plots required to produce this accuracy are shown below:

Radial Growth: forty-four plots

Age: twelve plots

Diameter Breast Height: two plots

Cubic Volume: twenty-nine plots

85 pages. \$2.00. Mic 57-738

AGRICULTURE, PLANT CULTURE

EFFECT OF STAGE OF MATURITY, CUTTING TREATMENT, AND FERTILIZATION ON THE YIELD AND CRUDE PROTEIN, CRUDE FIBER, AND ETHER EXTRACT CONTENTS OF CERTAIN GRASSES AND LEGUMES

(Publication No. 20,224)

William Hunter Bennett, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Henry L. Ahlgren

Investigations were carried out at the University of Wisconsin from 1949-1951, inclusive, to determine the yields and chemical composition of reed canarygrass and tall fescue at different stages of maturity and under different cutting and fertilization treatments. The performance of these species was compared with that of timothy, Kentucky bluegrass, smooth bromegrass, alfalfa, and ladino clover grown alone and two grass-legume mixtures.

All grasses were fertilized with PK and NPK and were also grown without fertilization. The legumes and mixtures did not receive the NPK treatment.

The plots were seeded in April 1949, and were given different cutting treatments in 1950. These provided for harvesting at three stages of maturity (pasture, intermediate, and hay). Residual effects of the treatments were measured by cutting all plots at the hay stage in 1951 and determining forage yields on a weed-free basis.

Leaf-stem-inflorescence ratios were calculated for all the species on four different sampling dates in 1950 and the crude protein, crude fiber, and ether extract contents of each portion determined. Chemical analyses for these constituents were also made on the entire harvested portions of the species for certain of the harvests in 1950.

Timothy was significantly higher yielding than all other grasses in both 1950 and 1951. Reed canarygrass and tall fescue ranked next to timothy in yield.

Legume-grass mixtures and legumes alone outyielded grasses alone. The alfalfa-smooth bromegrass mixture was significantly higher yielding than the ladino clover-smooth bromegrass mixture.

Highest yields were obtained with ladino clover and the alfalfa-smooth bromegrass mixture when harvesting was done at the intermediate stage of growth. All other species and mixtures gave their highest yields at the hay stage.

The cutting treatments applied in 1950 had no significant residual effect on the yields of grass species in 1951. However, there was a highly significant residual effect on the yields of the legumes.

Nitrogen fertilizer increased the yields and crude protein content of the grasses in the first pasture, first intermediate, and first hay harvests, but the effect was shortlived. Grasses and legumes were less leafy when fertilized than when not fertilized.

Alfalfa and ladino clover had higher crude protein contents than any of the grasses and were relatively low in crude fiber. Alfalfa was lowest of all the species in ether extract content.

Reed canarygrass had the lowest crude fiber content of all the grasses at all harvests and had relatively high crude protein and ether extract contents. Tall fescue ranked consistently low in these constituents. Growing legumes in association with smooth bromegrass had little effect on the crude protein content of the legumes but increased the crude protein content of the grass, in most cases.

In general, the crude protein and ether extract contents of the species decreased and the crude fiber content increased with advance in maturity. However, there were some exceptions to this general behavior.

In every species the leaves and inflorescences were much higher in crude protein and ether extract and lower in crude fiber content than the stems.

Legume leaves and inflorescences had higher contents of crude protein and lower contents of crude fiber and ether extract than the corresponding portions of grasses, with few exceptions.

Reed canarygrass leaves and stems were higher in crude protein and lower in crude fiber content than the leaves and stems of other grasses.

199 pages. \$2.60. Mic 57-739

SOME OBSERVATIONS ON BLACK SPOT OF POTATOES

(Publication No. 20,014)

Donald James Cotter, Ph.D. Cornell University, 1956

Black spot of potatoes, a subsurface darkening disorder of the tuber, is a serious problem of national scope. Previously, extensive research was done concerning the influence of variety, field nutrition, and storage factors on the expression of the disorder. Since none of the factors studied resulted in a commercially acceptable control measure, the present experimental work employed several approaches in an attempt to understand the black spot problem more fully as well as creating new, more promising leads for future study.

It was hypothesized that lower rates of respiration and concomitantly lower quantities of metabolite hydrogen could result in higher incidences of black spot due to excessive accumulations of dopa quinone. The normal respiration rate, as measured by carbon dioxide liberation and oxygen consumption, and the respiratory quotient did not relate to the observed black spot incidences. The changes in both carbon dioxide and oxygen induced by bruising parralleled the black spot indexes. However, a cause and effect relationship was not demonstrated.

The influence of ionizing radiations from cobalt⁶⁰ on black spot was tested. The data from two years conclusively demonstrated that irradiation did increase black spot. During 1955-56, a dosage of 5,000 r was sufficient to significantly increase the incidence of black spot. Yearly differences in dosages at which black spot increased varied, indicating that factors associated with yearly changes modify the expression of irradiation induced increases of the disorder. Fast electrons also resulted in increases in black spot. The influence of storage time and pre-heating treatments resulted in similar changes in black spot for irradiated and normal tubers. Analyses for ascorbic acid, sulfhydryl compounds and tyrosinase were made to determine the relationship between these factors and black spot. Although no cause and effect relationship for any of these

fractions could be demonstrated, high ascorbic acid seemed to provide natural radioresistance to black spot increases. Tyrosinase increased as the dry matter increased. An analysis of the results using irradiation as an experimental tool for studying suggests that irradiation induced changes occur at the actual site of the black spot reaction.

Since the tyrosine-tyrosinase reaction is responsible for the black pigment production, foliar applications of a number of chemicals known to inactivate tyrosinase by copper chelation were applied. Ethylenediaminetetracetic acid used over a wide range of application dates, varieties and concentrations resulted in no influence of black spot. Similarly, eighteen other copper chelating materials had no influence on black spot. Para-chlorophenoxyacetic acid, a chemical demonstrated to reduce a similar darkening disorder of pineapples, was ineffective in reducing black spot.

A method for the measurement of oxygen permeability of potato tissue is described. The results obtained using the method for studying black spot were inconclusive.

94 pages. \$2.00. Mic 57-740

BREEDING BEHAVIOR OF CERTAIN AGRONOMIC CHARACTERS IN PROGENIES OF SUGARCANE CROSSES

(Publication No. 17,444)

Leo Placide Hebert, Ph.D. Louisiana State University, 1956

Supervisor: Professor Merlin T. Henderson

Stalk diameter, erectness of stalk, or adaptability to mechanical harvesting, number of stalks per stool and Brix and sucrose (pol) content of the juice in first stubble single stools, and in both plant cane and first stubble of clones established from these single stools, were determined from the progenies of seven crosses of sugarcane used in the breeding program at the U.S. Sugarcane Field Station, Houma, La., during the period 1953 to 1955, inclusive. Correlation coefficients for stalk diameter between single stools and clones were positive and significant and consistently high enough in all crosses to be considered reliable in making selections either in single stools or clones. The degree of association for Brix as determined by hand refractometer with the composite juice taken from the middle internode of each of five stalks with a special punch (Hawaiian type), varied among the seven crosses studied, and it is concluded that selections for Brix would be fairly reliable if not too rigid. Correlation coefficients for erectness of stalks and number of stalks per stool, while positive and significant between single stools and both years of the clones, were of a low order and although it is concluded that selection among single stools would have some value in most crosses, it would not be as effective as in the case of stalk diameter or Brix. Selection for these two characters should not be too rigid among the single stools. The correlation coefficients for both Brix by hydrometer and for apparent sucrose (pol) as determined in the crusher or first expressed juice of five stalks from each clone were among the two highest r values

obtained and either or both of these characters are highly reliable in selection of varieties in any single season.

The four characters involved in the three years of the study, i.e., stalk diameter, erectness, number of stalks per stool and percent Brix, were independent and no special difficulty should be encountered in selecting individual clones with any combination of the four characters. There was a negative and significant association between number of stools per plot ant stalks per stool in the clones, but the r values were relatively low in all the crosses. Sucrose (pol) was independent of stalk diameter, erectness, or number of stalks per stool, but was closely associated with Brix percent.

In general there was a close association between the characteristics of the parents involved in a cross and the progeny of that cross for all four characters studied. Average values of the two parents for stalk diameter, erectness, number of stalks per stool, and Brix, agreed very closely with both the average values of the progeny and with the percentage of the progeny in the different classes.

119 pages. \$2.00. Mic 57-741

SODIUM AND POTASSIUM INTERRELATIONSHIPS IN SOIL AND MINERAL SYSTEMS AND THEIR EFFECTS UPON THE NUTRITION OF FLUE-CURED TOBACCO

(Publication No. 20,173)

Thomas Barksdale Hutcheson, Jr., Ph.D. North Carolina State College, 1956

Supervisors: Willie Garland Woltz and Stanley Bert McCaleb

Laboratory, greenhouse, and field experiments were conducted to study sodium-potassium interactions in soil and mineral systems and the effects of sodium and potassium on the nutrition of flue-cured tobacco. Three laboratory investigations designed to study the effect of various ionic solutions upon the release of sodium, potassium, and calcium from granitic and feldspathic materials were carried out. A greenhouse experiment was conducted in conjunction with the laboratory studies in an attempt to correlate the possible release of sodium, potassium, and calcium by the mineral materials with growth response and uptake of these elements by flue-cured tobacco plants.

Three additional greenhouse studies were conducted to study the effects of sodium and potassium supplied in nutrient solutions on the nutrition of flue-cured tobacco grown in quartz sand. Four field experiments were carried out to study the effects of various rates and combinations of applied sodium and potassium on flue-cured tobacco production and to correlate these effects with possible sodium-potassium interactions in soil systems.

Mineral materials used in the laboratory and greenhouse investigations and soils of the field experiments were characterized as to their chemical properties, particle size distributions, and mineralogical constitutions. Field soils were also classified and described in detail by genetic horizon.

Laboratory investigations indicated that release of sodium, potassium, and calcium by granitic and feldspathic

materials to ionic solutions was largely the result of hydrolysis and carbonation. Only potassium appeared to be transferred from the solution to the mineral phase with a subsequent release of other cations to solution.

Greenhouse investigations conducted in conjunction with the laboratory studies revealed that the potassium content of plants appeared to be more affected by the mineral materials in which they were grown than laboratory data would have led one to expect. Plants grown in the granitic and feldspathic materials high in potassium contained considerably more potassium than plants grown in the quartz or high sodium feldspar sands, particularly when sodium was supplied at low levels of potassium in nutrient solutions. Potassium content and growth of plants were greater when grown in the high potassium minerals with solutions containing sodium than when grown in the same mineral materials with solutions containing neither of the elements. This appears to indicate that the presence of sodium in solution affected the mineral material in such a way as to render mineral potassium more available. Since this was apparent in plant mineral-solution systems, but not in mineral-solution systems, it further appears that plant roots were involved. Possibly the release of CO2 by the roots may have increased the solvent power of the solutions.

Neither sodium nor potassium applied to soils in field experiments appeared to affect the release of either of the elements from mineral reserves.

The essentiality and high requirement for potassium in the nutrition of flue-cured tobacco were evident in both greenhouse and field studies. Sodium did not appear to affect plant growth except when potassium was limiting. In such cases, the appearance of potassium deficiency symptoms was delayed and lessened in degree of severity by the presence of sodium. It appears that sodium may partially substitute for potassium in the nutrition of the flue-cured tobacco plant, at least when potassium is in short supply.

143 pages. \$2.00. Mic 57-742

STUDIES OF SOIL PHOSPHORUS FORMS IN TWO NON-CALCAREOUS ONTARIO SOILS

(Publication No. 19,838)

John William Ketcheson, Ph.D. University of Illinois, 1956

Satisfactory soil test correlations and formulation of fertility recommendations depend on a knowledge of the behaviour of various forms and fractions of soil nutrients. Adsorbed and acid-soluble forms of soil phosphorus have been related to phosphorus uptake by crops. The question as to the behaviour of these forms in Ontario soils was considered important in connection with soil advisory work in this area. In this study, the efficiency of adsorbed (extracted with .05N NH₄F) and acid-soluble (extracted with .05N Hcl) forms of soil phosphorus was evaluated in terms of plant growth, and the effect of phosphorus additions on the soil levels of these forms was determined for two different soils. The soils were Haldimand clay (pH 5.0) and Burford loam (pH 7.0).

For the plant study, three different samples of each soil were used to grow one crop of corn and of soybeans

in greenhouse pots. These samples were taken from differentially treated plots on the respective soils and exhibited different soil test levels for each of the two forms of soil phosphorus under study. Samples of the crop were taken every two weeks, and the total phosphorus content together with the proportion derived from native and applied forms determined. Phosphoric acid tagged with phosphorus-32 and adsorbed on synthetic anion-exchange resin was employed to establish this proportion. The total yield of dry matter and phosphorus percentage was determined at the end of the period. By using the phosphorus-32 data it was possible to calculate values for c in the Mitscherlich equation for adsorbed, acid-soluble, and fertilizer nutrient forms.

For the soil treatment study, increments of highly-soluble phosphoric acid and slightly-soluble rock phosphate were added to samples of each soil and kept moist in sealers for twenty weeks. Adsorbed and acid-soluble phosphorus levels were determined at the end of this period.

The results of the pot culture study showed that, in general, adsorbed phosphorus was more efficient than acid-soluble forms. Increases in the former resulted in greater soil phosphorus in the plant than did corresponding increases in the latter form. The relative efficiencies for the two forms are not the same, however, for both crops or for both soils. Acid-soluble forms exhibited a higher efficiency on Haldimand clay in the early growth of corn and the intermediate growth of soybeans. It was also apparent that the applied phosphorus was less efficient on the neutral Burford than on the acid Haldimand soil.

The additions of highly soluble phosphoric acid indicated a tendency for a greater build-up of adsorbed than of acid-soluble forms in both Haldimand and Burford soils. Additions of slightly soluble rock phosphate resulted in the reverse trend. The amount of the acid-soluble form built up by additions of highly-soluble material was greater in the Burford than in the Haldimand soil.

It was concluded that until definite distribution patterns for the two forms could be established for Ontario soils, the use of a combined adsorbed plus acid-soluble type of extractant would be of little value, and that a specific determination for each form would be required in making satisfactory tests for available soil phosphorus. The distribution of phosphorus forms with depth was also considered and a need for relating the fertility pattern in the soil profile with the root feeding pattern of the crop was suggested.

91 pages. \$2.00. Mic 57-743

PASTURE IRRIGATION CONTROL ACCORDING TO SOIL AND METEOROLOGICAL MEASUREMENTS

(Publication No. 18,414)

Kenneth M King, Ph.D. The University of Wisconsin, 1956

Supervisor: Associate Professor C. B. Tanner

Irrigation control is a soil management problem in which an attempt is made to maintain the soil moisture between a lower limit that will permit optimum plant growth and an upper limit that will avoid soil structure damage, poor aeration, plant disease, and waste of water. Successful irrigation control conserves available water resources and permits optimum crop production.

The above soil moisture limits vary with each soil and crop. In Addition, it is very difficult to measure the soil moisture content reliably. Thus an approach to irrigation control which obviates soil moisture measurements would be valuable. Such an approach is possible by making use of the dependence of the evaporation rate on the existing meteorological conditions. Knowledge of the evaporation indicates directly the decrease in the soil moisture.

Evaporation rates from an irrigated pasture were determined on seven days from energy-balance (the heat budget), from eddy diffusion relationships (the aerodynamic method), and directly from continuous-recording lysimeter measurements. In addition, because the crop was well supplied with water, the methods of Penman and Thorn-thwaite which give potential evaporation were compared on 54 days in July, August, and September.

On three of the seven days there was good agreement between heat budget and lysimeter evaporation over 44-minute intervals. These days were preceded by days with rainfall. On the other four days the heat budget indicates less evaporation than the lysimeter as the day progressed. For the day with the greatest discrepancy, the air temperature over the surrounding unirrigated fields was appreciably greater than in the irrigated field and a large horizontal temperature gradient existed across the irrigated field. It was concluded that there was a significant divergent air flow over the irrigated field and that this source of heat was not measured by the heat budget method.

The heat budget method is sufficiently accurate for pasture irrigation control. The evaporation determined by the heat budget was 85 per cent of the actual evaporation over the seven day period. The 15 per cent error is not of practical significance in view of the usual errors in irrigation water distribution. However, the heat budget method is complicated and suitable primarily for research studies. Further work is needed on corrections to the heat budget evaporation measurement for periods when horizontal divergence of sensible heat occurs.

Penman's method, essentially a simplified heat budget where net radiation is obtained from cloudiness, moisture, and temperature data, was on the average lower than direct measurements of evaporation on a daily or weekly basis over the period of 54 days. The correlation coefficient was 0.63 on a daily basis and 0.91 on a weekly basis. When measured net radiation was used there was close agreement between this modified Penman equation and the complete heat budget for the seven days. Neither of these latter two methods account for the divergence term which on two days was as high as 25 per cent of the total evaporation. If a simple integrating net radiometer were available, the modified Penman method would be very useful since it is easy to apply and has sufficient accuracy for most irrigation control work.

A lysimeter is not suitable for an absolute measure of evaporation. It requires a calibration for effective area. This was done by comparison of the lysimeter evaporation with the heat budget evaporation during periods when there was negligible horizontal divergence of sensible heat. The effective area changed drastically when the pasture was cut.

The product of the wind and the vapor pressure gradient was proportional to the lysimeter evaporation over some days. However, the proportionality "constant" was not

always the same and thus this simplified aerodynamic method alone would not be suitable for irrigation control.

The method outlined by Thornthwaite, in which evaporation is estimated from mean temperature, was tested over the same 54-day period. On a daily basis the correlation coefficient with measured evaporation was only 0.30 and thus this method does not appear suitable for irrigation control.

78 pages. \$2.00. Mic 57-744

INHERITANCE OF FIBER DENSITY IN A HYBRID BETWEEN UPLAND AND SEA ISLAND COTTON

(Publication No. 18,739)

Madhav Rajaram Limaye, Ph.D. Louisiana State University, 1956

Supervisor: Professor Merlin T. Henderson

A genetic analysis of four economic characters, seed index, lint density indes, lint index and lint percent, in three crosses of Upland (\underline{G} . $\underline{hirsutum}$) with Sea Island (\underline{G} . $\underline{barbadense}$) cottons, using parents \overline{F}_1 and \overline{F}_2 , was made.

Large seed size and high lint index were found to be dominant. A strong degree of hybrid vigor was found for seed index, which mainly gave higher mean lint index for F_1 . Absence of dominance for lint density index was found in all crosses. In two crosses low lint percent was found to be partially dominant, while in a third there was absence of dominance.

With the exception of lint index no evidence of transgressive segregation was found in the hybrids.

Although the inheritance of these characters was typically quantitative, relatively few pairs of genes appeared to govern the inheritance of seed and lint density index. This indicated that in a breeding program the breeder can establish desired seed and lint density index without much difficulty. There would be no difficulty in recovering plants with the desired lint index but this will not necessarily assure high lint density index and high lint percent. At least a few plants in the \mathbf{F}_2 had lint percent similar to that of the Upland parent, which indicated that desired lint percent can be established in selected strains without encountering great difficulty.

Relatively high heritability values for all characters were found in this interspecific hybrid. Due to the greater effect of environment on F_2 than on the parents, genetic variation in the F_2 was overestimated. However, selection for individual characters in F_2 would be fairly effective. Heritability for lint percent was higher than that for lint index, lint density index and seed index. This was evidenced by the lowest coefficient of variation in the parents for lint percent than that for any of the other three characters. Selection for lint percent would therefore be more effective than for lint index.

There was no association between seed index and lint density index. Highly significant positive correlations were found among lint density index, lint index and lint percent. Seed index was negatively associated with lint percent but the association was rather loose due to the influence of lint density index. Seed index and lint index showed a positive association. This association was almost perfect when the lint density index was held constant.

The association between lint index and lint percent was perfect when seed index was held constant. But when lint density index was held constant the association was found to be negative. Correlations in this interspecific hybrid were found to be similar to those observed in intrahirsutum crosses.

172 pages. \$2.25. Mic 57-745

THE ROLE OF ALUMINUM IN ION EXCHANGE REACTIONS OF ACID SOILS AND CLAYS

(Publication No. 20,174)

Aubra Clinton Mathers, Ph.D. North Carolina State College, 1956

Supervisor: Nathaniel Terry Coleman

The equilibrium concentrations of H, K, Na, Ca and Al in solution were determined when amounts of electrolyte corresponding to 0.25 to 2.0 symmetry concentrations were added to Kamec kaolin and Utah bentonite saturated with H, Na, Ca and Al. The values obtained show that the lyotropic series for these ions may be written Al>Ca>K>H>Na. Potassium release studies showed that K solubility may increase or decrease with Ca saturation depending on whether H or Al is the complementary ion.

Studies on the rate of reversion of H- to Al-clay showed that H-saturated clays are unstable; the rate of reaction was decreased by lowering the temperature; partial neutralization of the clay reduced the rate because it decreased the H ion concentration.

Plant growth studies indicated that there are two reasons for poor plant growth on acid soils; 1. nutrient deficiency particularly of Ca and Mg; 2. aluminum toxicity. The relative importance of these two factors varies from soil to soil, depending on the cation exchange properties.

138 pages. \$2.00. Mic 57-746

ECOLOGICAL GEOGRAPHY OF CERTAIN WISCONSIN FEED CROPS

(Publication No. 20,255)

Ross LeRoy Packard, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Henry L. Ahlgren

This dissertation attempts to analyze the geographic patterns of Wisconsin feed crops and to explain from the ecological point of view some of the reasons for the particular feed crops which are grown in Wisconsin. There have been several major shifts in the Wisconsin agricultural economy since statehood was achieved in 1848. However, few studies have been made which appraise the agriculture of the state from the standpoint of feed crops. This study was initiated with the hopes that there could be combined into a readily available source an analysis of the major factors which have affected Wisconsin feed crops.

The historical approach was utilized in this thesis as it appeared to be the most reliable method of evaluating the factors which were of the greatest importance to the development of the state's agriculture. Many of the crop patterns that exist and the customs of farming which are practiced originated as a result of ideas and theories prevalent in some era of the state's history. This detail relating to reasons for changes in crop patterns often becomes lost over the years, but the crop pattern or custom remains. Only by referring to the historical setting which existed at that time can these situations be properly evaluated. This was a critical factor in the decision to utilize the historical approach.

Wisconsin agriculture has developed from a cash crop type of farming into a dairy farming type of economy. This trend was already apparent prior to 1900. The early wasteful type of farming which characterized the years of wheat culture was doomed to failure because among other things little attempt was made to maintain soil fertility. The shift to dairying was not sharp and took many years. In the process, wheat acreage declined to a fraction of its record high. Corn became a major crop and oats became the established small grain for feed purposes. Legumes, a critical need for dairy farming, increased in importance and alfalfa has replaced the red clover to a large extent. Under present conditions corn, oats and alfalfa hay are the state's major feed crops.

The thesis concludes that there will be no major changes in the kinds of feed crops which will be utilized in Wisconsin during the next few dacades. There will be some shifts in the relative proportions of these crops. Briefly, these shifts will involve a probable increase in corn acreage in the state along with substantial yield increases. Oat acreage is likely to decline, possibly as much as 25 percent. The acreage utilized for hay will continue to be an important part of the cropland. More of this acreage will be seeded to the improved varieties of alfalfa with bromegrass while red clover and timothy will decline in importance.

260 pages. \$3.35. Mic 57-747

THE INFLUENCE OF SEVERAL MANAGERIAL TREATMENTS UPON THE GROSS MORPHOLOGY OF TIMOTHY

(Publication No. 20,256)

Elroy John Peters, Ph.D. The University of Wisconsin, 1957

Supervisor: Dr. M. J. Wright

The effects of three fertility treatments, two heights of cutting, and three frequencies of cutting upon the growth of timothy (Phleum pratense L.) were studied on Spencer-Almena soil at the Branch Experiment Station at Marshfield, Wisconsin.

Plots receiving 400 pounds of ammonium nitrate per acre in addition to 600 pounds of 0-20-20 fertilizer produced the largest yields of forage, while the yields on plots receiving only phosphorus and potassium fertilizers were not increased over the check.

On plots that received nitrogen fertilizer the yields of forage from the three-cutting treatment nearly equaled the two-cutting treatment. Within the other two fertility treatments the yields of forage declined with each additional frequency of cutting. During the first year of harvest plots clipped to 1 inch produced more forage than plots clipped to 4 inches, but during the second year of harvest the trend was reversed on plots where fertility was low.

Only during the first year of harvest on a fall-sown stand was there a significant decrease in root weight associated with the use of nitrogenous fertilizer.

Somewhat greater weights of roots were produced under the two-cutting treatment than were produced under the three- or four-cutting treatment. Plants cut to 4 inches produced slightly heavier root systems than did plants cut to 1 inch.

The average weight of corms decreased on plots receiving nitrogen and also decreased with each increase in the frequencies of cutting. These decreases in average weight were associated with increases in the numbers of secondary corms. Plots cut to a 4-inch height produced heavier corms than plots cut to 1 inch.

The use of nitrogenous fertilizers increased the protein content of corms; cutting four times reduced the protein content.

Heights and frequencies of cutting had little effect on the percentage of total available carbohydrates in corms. A slight reduction in the percentage of total available carbohydrates may have been due to nitrogen fertilizer.

The numbers of secondary corms and the numbers of shoots were increased by the use of nitrogen fertilizer. Frequent cuttings also caused an increase in the number of secondary corms.

Frequent and close cutting resulted in the death of many more corms than did the more conservative methods of cutting. An increase in the number of dead corms was especially apparent on plots receiving nitrogen fertilizer.

Both early cutting and nitrogen fertilizer encouraged the development of secondary corms, and the latter treatment also promoted the development of tertiary shoots.

Treatments with 2,4-D, at rates up to one pound per acre, did not have any marked effect upon the morphology or chemical composition of timothy.

Vegetative reproduction of timothy takes place by the development of shoots from nodes delimiting the corms. In the fall of the year these shoots take root, usually remain unelongated during the winter, and then elongate in spring to produce corms and flowering shoots. Secondary shoots grow during the summer from nodes adjacent to the corms and may elongate to form secondary corms.

141 pages. \$2.00. Mic 57-748

STUDIES ON THE RESPONSES OF SPRING WHEAT VARIETIES TO TEMPERATURE AND DAYLENGTH (PARTS I-IV)

(Publication No. 19,431)

John Alan Riddell, Ph.D. Purdue University, 1956

Major Professor: G. A. Gries

A comparative study was made of the influence of temperatures of 60°, 70° and 80°F and photoperiods of 8, 12, 16 and 20 hours on the rate of development and node number of late maturing as opposed to early maturing spring

wheat varieties. White Federation 38 (early) and Chinese (late) flower over the entire range of daylengths but become progressively earlier as the photoperiod is increased. This is a true photoperiod and not a total illumination response. Both short daylengths (8 hours) and high temperatures (80°F) retard pre-inductive development while short photoperiods and cool temperatures (60°F) retard postinductive growth. The varieties are more sensitive to changes in temperature during the day than the night on an equal day and night duration basis. With unequal exposures there is a complicating interaction between the accelerating effect of a long photoperiod on the response of temperature. The existence of nodes which have the capacity to produce vegetative structures even when the plant is visibly induced result in abnormal spike development and an inhibition in flowering when the plants are moved from a long-photoperiod to a short-daylength environment. Both varieties accumulate maximum amounts of dry weight under short-day, cool temperature conditions. No exact correlation was found between dry weight and plant height.

Late maturing spring wheat varieties differ quantitatively in their response to the environment from the early maturing types. Chinese (late) is relatively insensitive to photoperiod at a cool (60°F) temperature while White Federation 38 is maximally accelerated by long photoperiods and a warm (70°F) temperature. Chinese and Warden (late) are accelerated in development from the early seedling stage to flowering by a vernalizing treatment while White Federation 38 and Progress (early) are either uneffected or show a comparatively small enhancing influence. These findings are suggested as the reason for the earlier maturing date of Chinese as opposed to White Federation 38 under short day-cool temperature conditions. Plant height is greatest under cool temperature and medium daylengths (12 and 16 hours) with Chinese maintaining a height superiority over White Federation 38 under all environmental conditions.

Plants of the same variety grown from seed of different ages differ in their rate of development with the late maturing varieties having the greatest variability from year to year. This inconsistency of the response of spring wheat varieties to the environment can be corrected by a vernalizing treatment similar to that employed for winter wheat. Since the winter variety Knox can be partially vernalized by a cool (60°F) temperature exposure while the seed is maturing on the parent plant it is suggested that the reason for the variability in the growth of spring wheat varieties harvested in different years is due, in part, to the difference in the temperatures under which the seeds mature.

Spring wheat varieties flower earlier when the daily light-dark cycle is divided into several cycles in which the same ratio of light to dark is maintained. The earliness is apparently the result of shortening the dark period since briefly interrupting a normal 8-hour dark period with a half-hour light exposure is also effective in reducing the time to flower whereas briefly interrupting the 16-hour light period is without effect.

A number of growth influencing chemicals, including sucrose, naphthaleneacetic acid, 2,3,5 triiodobenzoic acid, maleic hydrazide, 2,4,6 trichlorophenoxyacetic acid, 2,4 dichlorophenoxy isobutyric acid, guanosine and adenine, failed to significantly promote the rate of development of Chinese or White Federation 38. 170 pages. \$2.25. Mic 57-749

THE SYNTHESIS AND EVALUATION OF NEW INSECTICIDES

(Publication No. 18,895) Edwin Neal Roth, Ph.D. Purdue University, 1952

Major Professor: Professor H. O. Deay

In the course of this study 19 materials were synthesized by addition, substitution, and/or exchange reactions involving the thiocyanate radical and seven nitroolefins, two acyclic materials, three heterocyclic materials, two aromatic materials, and five aliphatic materials. These materials were evaluated both in the laboratory and field as to their phytotoxicity, insect toxicity, and toxicity to rats.

Of these materials material H, thiocyanated 1,1-bis (p-chlorophenyl)-2,2,2-trichloroethane, and compound T (d,1-a-phenylthiocyanate) proved to be highly toxic to insects both in the laboratory and the field.

Material H displayed some unusual insect toxicity. It was toxic to squash bugs and blister beetles, neither of which are controlled by the parent molecule, DDT. It killed cabbageworms and potato leafhoppers as well as DDT. It did not control the eggplant flea beetle, spotted cucumber beetle, or striped cucumber beetle which are controlled by DDT. When administered to rats orally at the rate of 300 mg/Kg body weight it did not produce death as does DDT. In the fumigation test it was rated low.

Material H did not injure beans, potatoes, cabbage, or eggplant at any of the levels used. However, it was phytotoxic to both cucumbers and squash in the field. The degree of phytotoxicity was proportional to the concentration of the material in the formulation. The 4 per cent formulations killed approximately one-half of the cucumber plants treated, and stunted some plants in both the 1 and 2 per cent treatments. The 4 per cent level of material H killed very few squash plants, but at all concentrations a growth depression was evident which was proportional to the concentration used. All the plants produced fruit but fruiting was retarded.

Compound T displayed remarkable insect toxicity. It killed both nymph and adult squash bugs and meadow spittle bugs, house flies, blow flies, sharp-headed leafhoppers, blister beetles, and cabbage worms at percentage concentrations as low as 5 mg/sq. ft. It caused no phytotoxicity to beans or squash plants in the laboratory. In the fumigation tests it was rated moderate.

The insect toxicity of compound T can be attributed in part to the very reactive position of the thiocyanate group which is in alpha position to a benzene ring in the molecule.

The intravenous MLD of the compound to rats is approximately 100 mg/Kg (range of 62.5 to 100 mg/Kg) while the oral MLD is approximately 500 to 750 mg/Kg. Death is apparently due to respiratory failure as the heart does not cease to beat until respiration has failed. The compound apparently acts both on the higher nerve centers and the spinal cord as well as directly on the muscles, as indicated by the clonic and tonic convulsions and the muscular twitchings noted from observations on rats to which the material was administered.

A series of compounds similar to compound T can and should be made by varying the length of the side chain and/or placing various constituents on the benzene ring.

In addition there are d- and l- forms available in the molecule. 108 pages. \$2.00. Mic 57-750

FACTORS AFFECTING RESISTANCE OF WHEAT TO SCAB CAUSED BY GIBBERELLA ZEAE (SCHW.) PETCH.

(Publication No. 19,229)

Harry William Schroeder, Ph.D. University of Minnesota, 1955

Adviser: J. J. Christensen

The nature of resistance of wheat to Fusarial head and seed blight (scab) was studied in the present investigation. Thatcher, Lee, Rival and Frontana were the varieties of wheat studied most extensively, although additional varieties were also involved. A mixture of spores at a concentration of about 6,000,000 per cc from 5 races of Gibberella zeae was used in the inoculation studies. Resistance to infection, resistance to the spread of the pathogen after infection, the effects of stage of maturity of the host, the heritability of resistance and the determination of the morphological or physiological nature of resistance to the spread of the pathogen were the factors emphasized.

There are 2 principle types of resistance involved in resistance of wheat to scab. The first type, resistance to penetration, was measured by determination of the number of spikelets per head which became infected after the heads were sprayed with a spore suspension of the scab organism. Thatcher, susceptible to penetration, averaged from 9.9 to10.7 infected spikelets per head. The resistance to the spread of the pathogen was measured by counting the number of spikelets per head which became infected after a single spikelet on each head was inoculated with a hypodermic syringe. Thatcher, susceptible averaged 2.0 to 10.1 infected spikelets per head; while Rival, resistant, averaged 1.0 to 2.2. The stage of maturity of the head at time of inoculation also has a direct effect on penetration by the scab organixm and its subsequent spread. Avariety may be susceptible at the flowering stage and quite resistant at a later stage or vice versa. The number of scabbed or shriveled seeds produced directly indicates the extent of the spread of the organism in most varieties, however, Rival produced many kernels of normal appearance from which G. zeae could be isolated; indicating tolerance to the invading fungus. Additional exposure to high humidity after the original incubation period had little effect on the development of the disease.

Growth of \underline{G} . \underline{zeae} on water extracts from heads of resistant and $\underline{susceptible}$ wheat varieties gave no indication of the presence of a growth inhibiting substance in the resistant variety amenable to this type of extraction.

Histologic studies gave no evidence of a correlation of morphological differences with resistance. Mycelium was found 8 days after inoculation in the rachis of the susceptible variety, Thatcher, above and below the node from which an inoculated spikelet was attached. There was no mycelium found in the rachis of the resistant variety, Lee, after a corresponding period had elapsed after inoculation.

Inheritance studies indicated that both types of resistance are heritable. Apparently multiple genes are involved.

Dominance of susceptibility to spread of the pathogen was shown in the F_1 generation of Thatcher x Rival while a lack of dominance was indicated in the same cross in regard to resistance to penetration.

Although varieties highly resistant to scab have not been found in the common bread wheat or in other Triticum spp., most commercially grown varieties have some resistance. Varieties may be heterogenous in regard to genes controlling resistance. A combination of resistance to penetration and resistance to the spread of the pathogen will result in a variety with better than average resistance to scab.

61 pages. \$2.00. Mic 57-751

BREEDING BEHAVIOR OF FIBER IN SUGARCANE

(Publication No. 17,449)

Hridaya Nath Singh, Ph.D. Louisiana State University, 1956

Supervisor: Professor M. T. Henderson

Material used in this study consisted of the clonal progenies of seven crosses in sugarcane. The original crosses were made in November - December, 1951, at Canal Point, Florida. The entire material was maintained at Houma, La., by Mr. Leo P. Hebert. In November, 1955, the clones, which were in the first stubble crop, were harvested and the data for the present study were obtained.

From the bagasse of each clone, two samples were taken at random and were washed in the running water until sucrose free. Then they were dried to a constant weight which gave fiber in the sample, from which fiber content in bagasse and cane was calculated.

The method of duplicate sampling of bagasse for fiber determination proved to be highly accurate and reliable. The average coefficient of variation between duplicate samples was 1.8 per cent. The plot to plot variation was also low, with a coefficient of variation of 5.1 per cent, indicating that environmental variation among the unreplicated five foot plots of the clones was relatively small.

Significant positive correlations of about .70 were found in all crosses between per cent fiber and per cent bagasse in the cane, indicating that selection for low bagasse per cent would be moderately effective in obtaining low fiber types.

No correlation was found between per cent fiber and erectness of stalks. In some crosses, low but significant positive correlations occurred between fiber content and number of stalks per stool. This positive correlation will cause some difficulty when selection is practiced for low fiber content and high stalk number.

There were significant positive correlations between per cent of fiber and sucrose content. This positive association will cause difficulty in breeding programs in obtaining clones with high sucrose and low fiber content.

Fiber per cent in the cane is quantitative character and shows absence of dominance. The number of genes governing this character could not be determined because of heterozygous condition of parents and genes on chromosomes of S. spontaneum and S. officinarum will not undergo normal Medelian segregation. There was high frequency for the recovery of the parent types. Fiber content also

showed transgressive segregation which gave clones 2 - 3 per cent lower in fiber than low fiber parent while some were higher than high fiber parent.

A close relationship between fiber content of parents and progeny indicated that the behavior of progenies can be predicted reliably from the knowledge of the fiber content of parents.

The results led to the conclusion that a high fibered variety can be used in crosses provided the other parent has low fiber percentage. When both the parents are intermediate, the progeny will be mediocre. If both the parents are high in fiber, the progeny will be useless for obtaining low fiber types. 63 pages. \$2.00. Mic 57-752

AGRICULTURE, PLANT PATHOLOGY

STUDIES ON THE RATOON STUNTING DISEASE OF SUGARCANE IN LOUISIANA

(Publication No. 18,732)

Luther L. Farrar, Ph.D. Louisiana State University, 1956

Supervisor: Dr. R. J. Steib

A new virus disease affecting sugarcane in Louisiana was reported by Abbott in 1953 (1). This was apparently the same disease that had been under observation in Australia since 1944 and reported as causing severe losses, especially in stubble canes. Stubble canes are called ratoon canes in Australia, hence the name ratoon stunting disease.

Under Louisiana conditions irregular stands, leaves of somewhat lighter than normal color with a general unevenness of the tops has been associated with ration stunting disease. However, these symptoms are of little, or no, diagnostic value. Instead, the reddish-orange discolorations in mature nodes and the pink discolorations in immature nodes as described by Hughes and Steindl (15) were used and found to be reliable. In Louisiana, however, the pink discoloration was also found in the internodes, especially the first 2 to 4 posterior to the growing point.

Studies indicate that the ratoon stunting disease virus is easily transmitted mechanically, will remain infective for 2 days when stored at 70° F. and when diluted with distilled water to 1:10,000.

Heat treatment studies indicate that the disease can be eliminated if the internal temperature of the stalk is maintained at 49° C. for 2 hours or at 50° C. for at least 1 hour following the necessary duration and temperature to bring the cane to these temperatures. Prolonged treatments at 50° C., or higher, resulted in stand failures. Usually the internal temperature of the stalks at the end of a treatment was still 2 to 5 degrees (Fahrenheit) lower than the air temperature in the box. Results of thermal inactivation studies in vitro indicate that the virus is inactivated at 50° C. for 20 minutes, 52° C. for 15 minutes and 55° C. for 10 minutes. There are indications that heat treatments materially reduce the amount of latent red rot (Physalospora tucamensis) infection in stalks as well as increasing percent germination of eyes.

ANATOMY

Inconsistent results were obtained with all chemical tests except the hydrogen peroxide-hydrochloric acid test which always gave an Adriatic Blue-green color reaction in the immediate area of the fibro-vascular bundles found below the node of cane free of the ration stunting disease. Frequently a few fibro-vascular bundles would stain in virus-affected tissue, however, they were an off-color and could be easily distinguished.

Surveys indicate that the meadow nematode, <u>Pratylen-chus</u> spp. is found in greater numbers in the roots of sugarcane affected with ration stunting disease than in roots of cane free of the disease. 82 pages. \$2.00. Mic 57-753

BOTYROSPHAERIA RIBIS AND ITS RELATION TO A ROT OF APPLE

(Publication No. 20,189)

John Frederick Fulkerson, Ph.D. North Carolina State College, 1957

Supervisor: Carlyle Newton Clayton

The ascomycetous fungus, <u>Botryosphaeria ribis</u> G. and D., has been reported to occur on many woody, mostly decidous plants throughout the principal agricultural areas of the world. It is a destructive pathogen on currant, apple, tung, avocado, and other ornamental plants. As the causal organism of a rot of apple, it has caused heavy losses of fruit in recent years, particularly in the Eastern apple growing areas of this country.

Along with the original description of this fungus as a pathogen on currant, a morphologically indistinguishable, non-pathogenic form was also described. This form did not produce the purple-colored chromogenesis on alkaline starch media characteristic of the pathogenic form. Both forms were later reported as causing a rot of apple.

Dothiorella, Macrophoma, and Cytospora stages have been reported for this fungus. The relation of these spore stages, conditions surrounding their production in culture, the relationship of isolates from different hosts and geographical locations, and the occurrence of chromogenic forms have not been elucidated. In the report herein presented, 277 isolates of <u>B. ribis</u> from 17 different hosts and 11 geographical locations were studied in culture and as pathogens of apple, blueberry, and redbud.

475

Monoconidial isolates of <u>B. ribis</u> showed considerable uniformity in cultural characteristics except when obtained from unrelated parental types. Similar variation was noted among mass isolates from the various hosts and geographical locations. A yellow chromogenic type of culture was noted in the case of isolates obtained from blueberry in North Carolina and from a number of woody hosts in California. Two atypical isolates from apple in North Carolina also developed this coloration. All other isolates tested produced a light gray olivaceous to darkly olivaceous culture with essentially appressed mycelial growth. The blueberry and redbud isolates were as a class the most vigorous growing isolates tested.

Measurements of conidia produced in culture indicated 2 general spore sizes; a small type (17.3 - 15.6 x 7.2 - 5.9 microns) produced by redbud and blueberry isolates; and a large type (24.7 - 20.9 x 7.2 - 5.9 microns) produced by all other isolates used in this test. Conidia were never produced in culture in the absence of light and microconidia were rarely produced under any circumstances. Production of pycnidia in culture was quite variable, but not definitely associated with any host type.

All but 1 isolate studied induced a rot of apple. At temperatures of 65° to 75° F. the rot developed rapidly in most cases and was characteristically soft and clear or pink-tan in color. Where isolates induced a slower type rot, or at unfavorable temperatures, the rot was firm and brown or dark tan in color.

In general, the isolates from blueberry and redbud were capable of inducing a lesion when artificially inoculated on these hosts. In addition, 5 apple isolates, 2 pear isolates, and 2 isolates obtained from California were pathogenic on blueberry and/or redbud.

A purple chromogenesis occurred in some cultures of isolates on alkaline starch media when exposed to continuous fluorescent light at 300 F. C. for 6 to 12 days. Eleven of the 15 isolates found to develop this coloration were from blueberry or redbud, 2 were atypical apple isolates from North Carolina, and 2 were obtained from California.

79 pages. \$2.00. Mic 57-754

ANATOMY

DEGENERATION OF THE MAMMILLOTHALAMIC TRACT AFTER ULTRASONIC IRRADIATION

(Publication No 19,801)

James Francis Brennan, Ph.D. University of Illinois, 1956

Lesions were produced in the mammillothalamic tract of the cat by means of stereotaxically positioned focused ultrasonic irradiation. Frozen sections of the brains of animals killed nine to twenty-eight days after irradiation were prepared. Fifty mu sections were stained by the method of Weil to permit localization of the lesion and designation of nuclear configurations. The secondary degeneration of the fibers of the tract was studied with a modification of the Nauta-Gygax silver impregnation technique in twenty-five mu sections. This method is comparatively selective and permits degenerating axons to be observed while normal axons do not reduce the silver. Observations of the tissue sections prepared with this histological technique show that the mammillothalamic tract in the cat terminates in the ipsilateral anterodorsal, anteroventral and anteromedial thalamic nuclei and in the contralateral anterodorsal thalamic nucleus. The connections

to the anterodorsal thalamic nuclei are composed of larger diameter fibers than those to the anteroventral and anteromedial thalamic nuclei. The brain sections showed no positive evidence for connections to thalamic nuclei other than to the nuclei of the anterior thalamic group. In addition, no positive evidence was found to indicate the existence of fibers descending to the medial mammillary nucleus (thalamomammillary fibers) nor for direct connections from the mammillary bodies to the medial cortical areas.

85 pages. \$2.00. Mic 57-755

A HISTOLOGIC STUDY OF CHOLINE DEFICIENCY IN THE MOUSE

(Publication No. 17,872)

Roland Darrell Meader, Ph.D. University of Minnesota, 1956

One hundred ninety-six mice (12 weeks of age with a weight range of 18 to 20 grams) of a hybrid (Strong A x Bagg albino) stock were subdivided into the following 2 groups.

In the first group, 157 mice (94 of which were females) were maintained on the choline-deficient diet for 10 months. Daily, during the first 21 days and then at monthly intervals through 10 months animals were selected at random and were killed.

In the second group, 39 mice were fed the basal choline-deficient diet supplemented with 0.5% choline chloride for 1 day to 10 months. At least 1 mouse was killed daily for the first 21 days and at monthly intervals thereafter for 10 months.

In another group, 15 pregnant animals were used to study choline-deficiency in animals subjected to what might be considered as a "biological stress", pregnancy. Of these, 10 animals received the choline-deficient diet for 7 days, i.e., starting on the 14th day of pregnancy, and the remaining 5 animals serving as controls received the basal

choline-deficient diet supplemented with 0.5% choline chloride. All pregnant animals were killed (prior to parturition) on the last day of pregnancy (7th day on choline-deficient diet).

In another group 20 mice fed (10 mice for 16 weeks; 10 mice for 34-39 weeks) the basal diet were injected subcutaneously with 0.1 cc. of 1% aqueous trypan blue for 6 days immediately prior to death.

Excessive quantities of fat were deposited in the livers of mice maintained on choline-deficient diets for periods up to 10 months. Within 24 hours initial lipohepatosis was demonstrable as a multilocular liposis in the centrolobular parenchymal cells of livers of choline-deficient mice. Within 3 days multilocular liposis was observed in all parenchymal cells of the liver lobule, and after 14 days of choline-deficiency multilocular liposis changed to a unilocular liposis as a result of fusion of numerous cytoplasmic droplets in multilocular liposis. Supplementation of 0.5% choline chloride to the basal diet removed all fat from the liver within 3 days.

Fatty cysts of enormous dimensions were present in the livers of all mice after 150 days of choline-deficiency. No significant fibrosis was evident in any of the livers of the choline-deficient mice. Large nodules of parenchymal cell hyperplasia were observed in livers after 6 months of choline-deficiency. Ceroid deposition was a prominent feature in all livers in advanced choline-deficiency.

Pregnant mice exhibited no increased susceptibility to choline deficiency.

Significant damage to other organs was limited to occasional cardiac lesions which were evident after 16 weeks of choline-deficiency.

Control animals fed the basal diet supplemented with 0.5% choline chloride did not develop any significant abnormalities.

Vital staining experiments demonstrated that intracytoplasmic liposis did not produce and was not accompanied by atypical diffusion of an acid diazo dye into hepatic parenchymal cells. The absence of ceroid and segregated granules of dye in the same cells indicates a lack of participation of macrophages in ceroidogenesis.

111 pages. \$2.00. Mic 57-756

ASTRONOMY

THE EVOLUTION OF EARLY MAIN SEQUENCE STARS

(Publication No. 20,129)

Ram Singh Kushwaha, Ph.D. Princeton University, 1956

The early phases of evolution for three early main sequence stars with masses ten, five and two and a half times the solar mass are considered. The range of spectral types covered is from B1 to A2. Radiation pressure is taken into account. Opacity is computed by straight addition of electron scattering and Kramers' absorption with modified guillotine factor. The initial homogeneous

models for these stars are constructed and their evolution is followed. It is found that the convective core retreats creating an inhomogeneous radiative zone between itself and the outer homogeneous radiative envelope. During the early evolutionary phases all the nuclear energy is generated inside the core. These early evolutionary phases are represented here by a series of three or four inhomogeneous models for each of the three stars. For the heaviest mass one later inhomogeneous model is also computed in which the energy generation in the intermediate zone is accounted for. It is seen that the H.R. diagram constructed from these models agrees well with the observed one for galactic clusters. The theoretical models are also checked by computing the apsidal motion constants for the three

initial models as well as for some of the later models.

Quite satisfactory agreement is found with the observations.

44 pages. \$2.00. Mic 57-757

A SPECTROSCOPIC INVESTIGATION OF ALGOL

(Publication No. 20,138)

Alan S. Meltzer, Ph.D. Princeton University, 1956

Three 100" Coude spectrograms of Algol at minimum were obtained in the region λ 5800 — λ 6700. All three plates show relatively sharp, faint lines of spectral type F. Radial velocities measured from these lines do not show the acceleration between two plates taken at the same minimum that would be expected for star B. All three plates yield radial velocities in good agreement with the velocity curve of star C.

A separation of the light of B + C is carried out and the results are given, for $\pi = 0.0408$ and $\pi = 0.032$, in Table 5. A study of the masses leads to the assumption of $\pi = 0.032$. With this value, the system is given by:

| Star | A | В | C | |
|----------|-------|--------|------------|----------|
| Sp. Type | B8V | KoIV | F2V | |
| C.I. | 27 | +.85 | .22 | |
| Mv | -0.08 | +3.40 | +3.20 | |
| Mass | 5.0 | 1.0 | 1.3 | |
| | 35 | pages. | \$2.00. Mi | c 57-758 |

A STUDY OF THREE SHELL STARS

(Publication No. 20,152)

Leonard Searle, Ph.D. Princeton University, 1956

The spectra of three shell stars, 1 Del, HD33232 and HD195407 have been studied from high dispersion plates. Equivalent widths of all unblended shell absorption lines were measured and ionic abundances derived. From plates of 1 Del at a dispersion of 4.9 A/mm line profiles of 27 FeII, CrII and TiII absorption lines were measured. The profiles of the H α and H β emission lines in HD195407 were also obtained. The colors of all three stars, measured photoelectrically, are normal for the spectral types of the underlying stars.

In 1 Del stratification is indicated by a striking difference between the profiles of the FeII lines which are symmetrical, and those of TiII, which are 20 percent wider than the FeII lines and markedly asymmetrical, with the red wing considerably stronger than the violet one. The profiles of the CrII lines are similar to those for TiII. In all three stars dilution effects are prominent. In HD195407 both the population of the metastable He levels and the line widths indicate a dilution of about W=.05. For 1 Del and HD33232 a dilution factor of about W=.01 is indicated for the essentially geometrical dilution of radiation longward of the Lyman limit. The electron density in the shells of HD33232 and 1 Del is about 5.10¹¹/cm³ and the mass of these shells is estimated to be about 10²³g.

53 pages. \$2.00. Mic 57-759

BACTERIOLOGY

THE INTERFERENCE PHENOMENON WITH NEWCASTLE DISEASE VIRUS

(Publication No. 20,357)

John Halden Carr, Ph.D. Kansas State College, 1957

Numerous instances of the interference phenomenon have been described since Hoskins' first report in 1935 that the presence of the yellow fever virus would block the entrance of the viscerotropic strain in cells of rhesus monkeys. Few investigators, however, have been concerned with the mechanism of this exclusion.

The purpose of this study was (1) to test a series of fourteen virus strains for their ability to block or be blocked by Newcastle disease virus, and (2) to determine whether the interference component of the blocking agent in the most satisfactory system, i.e., swine influenza virus (SIV) in its exclusion of Newcastle virus (NDV), is identical with either its hemagglutinative (HA), complement fixative (CF), or embryo infective (EI) characteristic. Comparisons were made of the inactivation rate of each of these properties by a chemical agent, cyclohexyl [BIS $(\beta$ -cloroethyl)] amine hydrochloride (sulfur mustard), and a physical agent, ultraviolet irradiation.

Chick embryos were inoculated with greater than 10 and less than 100 lethal doses of SIV (V-15 strain) 3 hours prior to their inoculation with the same dosage of NDV (Manhattan strain). These embryos consistently showed a lower NDV HA titer and fewer deaths than embryos inoculated with the same dosage of NDV alone. HA of NDV and of SIV were distinguished by running the test with erythrocytes from different animals.

The hemagglutination property of SIV was the most resistant of the characteristics tested to the inactivating agents used, followed by the CF property, with the EI property of SIV being most sensative to the inactivating agents. Regardless of the resistance, the above-mentioned characteristics of SIV were inactivated in a uniform manner. This was not the case with interfering capacity of SIV. There was an optimum exposure time for the inactivation of the interfering characteristic; long periods of exposure to the inactivating agents resulted in a return of the interfering capacity.

Interference experiments using ultraviolet-irradiated SIV as the blocking virus yielded results similar to those obtained from experiments using the mustard-treated SIV. The fact that both agents are mutagens raises the questions whether nucleic acid components of the virus are responsible for the various properties, including the interference

characteristic, and whether the agents were acting upon the nucleic acids rather than the protein.

73 pages. \$2.00. Mic 57-760

THE RELATION OF CERTAIN MICROORGANISMS TO THE PLUGGING OF PAPER MACHINE WET FELTS

(Publication No. 19,198)

Robert Fredrick Drescher, Ph.D. University of Minnesota, 1956

Adviser: C. M. Christensen

The ability of wet felts to remove water from the paper sheet is important in the process of paper manufacture. Tests of 58 felts indicated that there was considerable variation in the porosity of various felts and sometimes variation across the width of a given felt.

The deposits within the felts which are responsible for the decreased water porosity were found to be comprised of various nonliving materials and microorganisms. Mineral substances appeared to be the principle bulking agents, and comprised 20% of the dry weight of some felts. Microorganisms, rosin, wool felt scales, carbohydrate gums, and ferric and aluminum hydroxide gels appeared to be the binding agents. The maximum amount of these materials found in the felts was: rosin, 8.6%; carbohydrate gums, 1.1%; ferric hydroxide, 3.5%; aluminum hydroxide, 4.1%. The use of neotetrazolium chloride, a dye which becomes colored in the presence of living bacteria, indicated that bacteria were present on the wool fibers, within the interfiber spaces and associated with the deposited material within the felt.

Sphaerotilus natans, a filamentous ensheathed iron bacterium, was isolated from 54% of the felts obtained from 13 different paper mill companies located in 9 different states. Laboratory studies indicated that this bacterium binds clay particles to its iron encrusted sheath and that the filaments collectively entrap clay particles by the interweaving of the filaments.

Fungi, although frequently encountered in previous work on the plugging of felts, appeared to be the principle agent involved in the plugging of only 1 felt. The mycelium was coated with ferric hydroxide which in turn bound mineral particles. The mold mycelium also appeared to collectively entrap mineral particles by the interweaving of the filaments.

77 pages. \$2.00. Mic 57-761

ADAPTATION OF THE TANNIC ACID HEMAGGLUTINATION TEST FOR USE IN THE STUDY OF HEMOPHILUS PERTUSSIS ANTIGENS AND ANTIBODY

(Publication No. 20,074)

Bernice Carter Graham, Ph.D. Michigan State University, 1956

The tannic acid hemagglutination test developed by Boyden (1951) is based upon the ability of washed red blood

cells, modified by treatment with dilute tannic acid solution, to adsorb protein antigens as well as polysaccharide. These "sensitized" cells are then agglutinated when mixed with dilutions of homologous antisera. The test thus becomes useful in determining antibody titer of serum and in identifying antigens by checking with known antisera.

This study was carried out to determine whether the tannic acid hemagglutination test could be used in studying H. pertussis antigens and antibody as it has been used in the studies of antigens of M. tuberculosis (Boyden and Sorkin, 1955) and capsular antigens of P. pestis (Chen and Meyer, 1954; Landy and Trapani, 1954).

Three strains of <u>H. pertussis</u> were grown in liquid culture medium with constant shaking. At the end of the incubation period the liquid cultures were subjected to sonic oscillation treatment to break up the bacterial cells. A portion of this material was then contrifuged immediately to remove insoluble debris.

To gain some information concerning the antigenicity of these liquid <u>H. pertussis</u> cultures, mouse protection tests were carried out on these cultures before sonic treatment, after sonic treatment and on the supernatant fluids of the centrifuged, sonic treated cultures. Two of the three strains of <u>H. pertussis</u> tested showed a moderate amount of protection for mice whereas the third strain showed only a slight amount. Sonic oscillation treatment did not decrease the protective effect. Supernatant fluids from sonic treated cultures contained slightly less protective antigen.

The sonic treated cultures and supernatant fluids from these cultures were found to contain hemagglutinins for sheep cells modified by treatment with tannic acid. These hemagglutinins appeared to increase with incubation up to 30 hours and then gradually decrease to a low titer after 96 hours of incubation. Cultures of strains carried through six or less transfers from the lyophilized state produced a much higher hemagglutinin titer than those of the same strains carried through 26 transfers on artificial media.

Protein precipitated by the addition of ammonium sulphate solution to the supernatant fluids of sonic treated H. pertussis cultures or to the supernatant fluids of sonic treated organisms suspended in salt solution could be used to "sensitize" tannic acid cells. These sensitized cells were then susceptible to agglutination by rabbit anti-H. pertussis or mouse anti-H. pertussis sera.

Mice inoculated with the supernatant fluid from a liquid culture of H. pertussis in two doses equivalent to 5 billion organisms per dose developed a hemagglutination titer of 1:600. Mice inoculated with the same supernatant fluid but in amounts equivalent to 0.06, 0.3 and 1.5 billion organisms per dose did not develop demonstrable hemagglutination titers in the same period of time.

65 pages. \$2.00. Mic 57-762

A STUDY OF THE EFFECTS OF ANTIBIOTICS ON THE FORMATION OF AMINES BY INTESTINAL BACTERIA AND THEIR IMPORTANCE IN THE NUTRITION OF THE YOUNG RAT

(Publication No. 19,206)

George Melnykovych, Ph.D. University of Minnesota, 1956

Although the theory of intestinal intoxication as formulated originally by Mechnikoff was abandoned because of lack of experimental confirmation, the role of certain metabolites, e.g., amines, in animal nutrition has never been elucidated.

This thesis constitutes an attempt to correlate the action of antibiotics on the adaptive formation of amino acid decarboxylases by intestinal organisms with the role of these drugs in alleviating tyrosine toxicity in the young rat. The latter is believed to be caused by tyramine which is formed from tyrosine through the action of bacterial or the animal's own tyrosine decarboxylase.

I. Effects of antibiotics on amino acid decarboxylases of Escherichia coli (Crookes) and Streptococcus faecalis (R) were studied with customary manometric procedures by following carbon dioxide evolution from amino acids. Organisms were grown on crude, semi-synthetic and synthetic media, with and without antibiotics. Adaptive formation of amino acid decarboxylases was followed either in growing cultures or in resting cells. E. coli grown in a crude medium exhibited potent decarboxylating action toward following amino acids in decreasing order of activity: glutamic acid, arginine, lysine and histidine. In a mineralglucose-lactate medium only glutamic acid decarboxylase was demonstrated. Arginine decarboxylase activity was almost negligible and the other two enzymes were not found in detectable amounts. Of the three adaptive enzymes lysine decarboxylase required the addition of only lysine to the defined medium for adaptation, while the other two had more complex requirements. S. faecalis could synthesize tyrosine apodecarboxylase both in a crude and in a pyridoxal deficient, semi-synthetic medium.

Antibiotics of the tetracycline group, even when used in relatively high concentrations (as high as 336 ug per ml) did not inhibit the activity of either enzyme, on the contrary, they were somewhat stimulatory. However, these antibiotics were effective in inhibiting the formation of amino acid decarboxylases in concentrations as low as 0.005 ug per ml. Inactivation of arginine decarboxylase in resting cells and acetone dried preparations of E.coli was delayed by chlortetracycline.

This study suggests that antibiotics of the tetracycline group suppress the formation of amino acid decarboxylases through inhibition of the synthesis of apoenzyme.

II. Female weanling rats were fed semi-purified rations, containing either 60 or 18 per cent casein. Rations were fortified with histidine and tyrosine, each at a 5 per cent level (60 per cent protein ration), or with tyrosine at a 7 per cent level (18 per cent protein ration).

No toxicity, as evident from the normal appearance and growth rate of animals, was observed in rats on the high protein, histidine-tyrosine supplemented diet, in spite of marked increases of histamine in intestinal contents of these animals.

A toxic syndrome developed, however, in animals fed the tyrosine supplemented, low protein ration. Some animals in this group developed diarrhea and hyperglycemia. Oxytetracycline when incorporated in tyrosine-supplemented, low protein ration alleviated or even prevented the toxic syndrome, but was ineffective when administered parenterally. Marsilid, a monoamine oxidase inhibitor, did not aggravate the clinical picture of tyrosine toxicity, although the growth of animals in this group was retarded. Marsilid potentiated while oxytetracycline retarded the toxic effect of tyramine.

The possibility that the antibiotics improve the wellbeing of the rat through suppression of amine formation is discussed. The actual proof was not furnished because of inadequacies in the assay methods for quantitating tyramine. 152 pages. \$2.00. Mic 57-763

GLUCOSE UTILIZATION AND POLYSACCHARIDE PRODUCTION BY AZOTOBACTER INDICUM

(Publication No. 20,258)

Clara Mae Quinnell, Ph.D. The University of Wisconsin, 1957

Supervisors: Professors P. W. Wilson and S. G. Knight

Azotobacter indicum has many properties which distinguish it from other members of the genus Azotobacter. It is the only species that will grow and fix nitrogen over the wide pH range of 3.0 to 9.0. In addition, it lowers the initial pH to approximately 3.5 during growth on Burk's or a similar nitrogen-free medium, and it is further distinguished by its slow growth and the production of large amounts of extracellular polysaccharide. Because of these differences, investigations of the growth characteristics and the carbon metabolism of the organism were made.

For the experiments, the organism was grown in shake flasks, and measurements of growth were made either turbidimetrically or by the determination of cell nitrogen. Originally, the lag phase of A. indicum extended over a period of 6 to 7 days. Attempts to decrease this lag, which included supplying different carbon sources as substrates, varying conditions of pH, inoculum size, temperature and aeration, and providing possible growth factors, were only partially successful.

Of the carbon sources supplied, glucose allowed the most rapid growth initiation, and by repeated transfer of cells from the exponential phase into a similar medium, the lag was shortened to 48 hours. It was observed that the pH dropped to approximately 6 before rapid multiplication occurred, and when the organism was inoculated into the medium previously adjusted to pH 6.0, the lag was decreased to 30 hours. It was also found that increased inoculum size up to 5% of the culture volume decreased the length of the lag; with a 5% inoculum, the lag was shortened to 20 hours, but it could not be shortened further.

When A. indicum was grown under these conditions, the acidity of the culture regularly increased until a pH of 3.5 to 4 was reached. From carbon balance determinations, the increase was found to be the result of production by the organism of small amounts of acetic acid. In addition, the results indicated that a large proportion of the sugar carbon consumed was converted to cellular material and polysaccharide and that the amount depended on the

aeration rate. The assimilation varied from approximately 30% of the carbon utilized under conditions of high aeration to 70% of the carbon utilized under lower aeration. Except for the limited amount of acetic acid formed (2 to 3% of the carbon utilized), the remainder of the carbon was evolved as carbon dioxide.

Since the polysaccharide of \underline{A} . $\underline{indicum}$ constitutes a major product of its metabolism, work was directed toward the production of the poly saccharide and the identification of its constituents. A procedure was developed for the isolation and purification of the polysaccharide which resulted in a product containing approximately 5% ash, 0.4 to 0.6% nitrogen and 40% carbon.

For further analysis, the individual components of the polysaccharide were freed by subjecting the material to acid hydrolysis. The presence of pyranose ring structures in the polysaccharide was indicated by the relative stability of the glycosidic linkages to the hydrolytic procedures used.

The results obtained when the hydrolysates were analyzed by paper chromatography, the spectrophotometric reactions of Dische and other specific quantitative assays showed that the polysaccharide produced by A. indicum is a polymer of glucose, glucuronic acid and an aldoheptose in the ratio of 3:2:1. 97 pages. \$2.00. Mic 57-764

A STUDY ON THE BIOLOGICAL ACTIVITY OF TWO THERMOPHILIC ACTINOMYCETES WITH SPECIAL REFERENCE TO PROTEOLYTIC ACTIVITY

(Publication No. 20,084)

Lawrence Lee Reed, Ph.D. Michigan State University, 1956

Two thermophilic actinomycetes were isolated at 45 to 50 C from an active vegetative compost. One species produces spores in chain-like fashion at the terminal ends of hyphae and is classified as a thermophilic Streptomyces species. The other species produces single spores at the tips of extremely short sporophores that are side branches of the hyphae. This type of spore formation places this species either in the genus Micromonospora (Bergey) or in the proposed genus Thermoactinomyces (Waksman and Corke). The latter genus is more valid for the thermophilic forms of this type of actinomycete. Both of the organisms are gram positive and non-acid fast.

Temperature studies showed that neither of the species could develope growth at temperatures below 35 C or above 59 C and the optimum temperature is 50 to 52 C. The organisms develope optimum growth between pH 7.0 to 8.5 and very little, if any, growth occurs below pH 6.0 or above

pH 9.0.

Growth characteristics were observed on 21 different media. These thermophilic actinomycetes are aerobic since they grow only at the surface of stationary liquid and stab cultures. On media supporting good growth, the Thermoactinomyces sp. produces a very light cream colored vegetative mycelium and a white to light grey aerial mycelium that appears dry and fragile. The Streptomyces sp. also has a cream colored vegetative mycelium with white aerial mycelium which becomes grey with the production of spores. No pigmentation is produced on any of the media by either of the organisms. Both of the species

liquefy gelatin and cause proteolysis of milk after the formation of a curd. Cellulolytic activity is negative.

When inoculated into solutions of maltose, mannitol, dextrin, sorbose, cellobiose, fructose, rhamnose, lactose, sucrose, and glucose, the <u>Streptomyces</u> species ferments all but rhamnose, sorbose, and lactose whereas the <u>Thermoactinomyces</u> species utilizes only glucose, fructose, and sucrose. Of the following organic acids; malic, fumaric, succinic, pyruvic, citric, lactic, oxalic, and tartaric only pyruvic acid is utilized and then only slowly by <u>Streptomyces</u> sp.

Proteolytic activity was studied using casein, gelatin, and phytone in a basal salts solution. Each organism was inoculated into each type of protein medium contained in a series of flasks and growth was developed in shake culture at 50 C. Samples were removed at various times during a 72 hour incubation period and from each sample, mycelial weights and ammonia were determined. By means of paper chromatography, free amino acids were determined in growth samples of casein and gelatin. Mycelial weights, when plotted against incubation time, produce curves very similar to bacterial growth curves but the area of the curve that corresponds to decelerated growth in bacteria is actually an autolysis in the actinomycetes. Ammonia was produced from the proteins in amounts considerably in excess of the physiological requirements of the organisms. Graphical interpretation of the data produced sigmoid-type curves which show ammonia production continues even during the period of autolysis. The ammonia is apparently released by deamination during proteolysis.

A total of seventeen amino acids and two amines were identified in the culture filtrates. The number of amino acids occurred in groups of ten or less for each incubation increment of the total 72 hours. Larger numbers of amino acids were found in cultured casein medium than in the cultured gelatin medium. The identified compounds were: cystine, cysteine, lysine, asparagine, histidine, arginine, glutamine, glutamic acid, aspartic acid, serine, hydroxyproline, threonine, alanine, proline, tryptophane, methionine, valine, phenylalanine, and isoleucine. The number of amino acids found, the amount of growth produced, and the amount of ammonia produced from proteins indicate that these thermophilic actinomycetes are strongly proteolytic and possess a very active deaminase system.

REFERENCES

Breed, R.S., Murray, E.G.D., and Hitchens, A. Parker 1948 Bergey's manual of determinative bacteriology. Sixth Edition The William and Wilkins Co., Baltimore, Md.

Waksman, S.A., and Corke, C.T. 1953 <u>Thermoactino-myces</u> Tsiklinsky, a genus of thermophilic actinomycetes. J. Bact. <u>66</u>, 377.

70 pages. \$2.00. Mic 57-765

STUDIES ON ACQUIRED CELLULAR IMMUNITY TO HERPES SIMPLEX

(Publication No. 19,935)

Robert Walker Tankersley, Junior, Ph.D. Stanford University, 1956

The hypothesis that cells of the host can develop or acquire antiviral immunity independent of the immune status of the host as a whole is an old one. Frequent attempts have been made to demonstrate such a cellular resistance to viruses, without marked success or acceptance. Current knowledge of the virus-host relationship appears to provide a number of phenomena most easily explained on the basis of cellular immunity. Because of this, the present studies were undertaken to attempt to demonstrate this type of immunity, and by this demonstration to contribute to the understanding of one host-virus relationship.

These studies consisted primarily of attempts to demonstrate cellular immunity of the guinea pig cornea to herpes simplex virus. Avascular corneal tissue was used to minimize the presence and effects of specific neutralizing antibody. The test animals were given a series of intraperitoneal injections of living or formalin-killed virus to induce the development of immunity. Immunization was in some cases by intracorneal virus challenge to verify immunity and at the same time to act as a further stimulus to immunity.

The first study was an attempt to examine the immune status of corneal tissue from immune animals after the tissue was grafted to normal guinea pig eye. While corneal tissue could be transferred successfully from one normal guinea pig to another, this was not possible when one of the animals had been immunized. In this case, a severe corneal reaction consisting of clouding and vascularization appeared in about three days, particularly in the eye of the normal recipient animal. The basis for this reaction appeared to lie in the presence of a latent virus in the transferred cornea, or in an immunological reaction directed against this cornea. Attempts to demonstrate the presence of a latent virus were unsuccessful, while the time interval after which the reaction appeared was much shorter than that required for the usual

immunological reaction. Thus, no explanation could be found for the graft failures, and the technique was abandoned.

Tissue culture of immune guinea pig cornea proved to be a more suitable method for studying cellular resistance to herpes simplex. Two types of growth, epithelial and fibroblastic, were observed from corneal explants. Upon inoculation of virus into the culture tubes, it was found that corneal epithelial cells were invariably susceptible to infection, whether these cells were from normal or immunized animals. The fibroblasts, on the other hand, were only susceptible if they came from normal animals, or animals immunized with killed virus. In three cases, fibroblasts derived from animals immunized with living virus were resistant to virus infection. Since the system contained no specific antibody, this resistance must have been the result of a newly-acquired property of the cells themselves.

Attempts were also made to demonstrate the mechanism involved in acquired cellular immunity. Evidence of "spontaneous" infection was obtained with both the cornea-grafts and tissue cultures, and this seemed to support the idea that resistance might be due to an interference effect by a latent, possibly incomplete, intracellular virus form. The presence of such a form could not, however, be demonstrated conclusively. This question was also pursued in HeLa cell tissue culture, in the chick embryo, and in white mice. In the case of HeLa cells, one instance was seen in which cells surviving virus infection were used to start new cultures, which were resistant to challenge with virus. Trypsinization and transfer of these cells for further culturing resulted in the spontaneous appearance of foci of virus infection. The chick embryo was examined for increasing resistance to virus as the infection progressed, and for the presence of latent or interfering virus particles in the allantoic fluid. These attempts were not successful, nor could any interference or protection be shown when these allantoic fluids were inoculated intracerebrally into mice.

Thus, results of these studies suggest the presence of acquired cellular immunity in the fibroblastic cells of the immunized guinea pig cornea, but no evidence as to the possible mechanism for such resistance was obtained.

103 pages. \$2.00. Mic 57-766

BIOLOGY

BIOLOGY, GENETICS

INHERITANCE OF RUST RESISTANCE IN ALFALFA

(Publication No. 20,178)

Will Allen Cope, Ph.D. North Carolina State College, 1956

Supervisor: Dr. Clarence H. Hanson

Inheritance of rust reaction was studied in three alfalfa populations subjected to a natural epidemic of rust in the field. Each population consisted of cloned and selfed progenies of the parents, F_1 , F_2 , and backcrossed progenies.

Genetic models postulated by Powers' partitioning technique indicated that three or four loci were involved, with possibly one or more additional genes with smaller effects. The genetic models and progeny means indicated that genes for resistance were partially dominant at two loci. Genes for susceptibility were dominant at one, and possibly two loci. These two sources of information indicated that, in addition to dominance, interactions of an interallelic type occurred.

Estimates of the variance components indicated that dominance variance was about equal to or slightly less

than the additive variance, more consistent estimates being obtained from variances than from covariances. Good agreement was obtained between genetic variances obtained from the analysis of variance and theoretical variances computed from the genetic models postulated from Powers' partitioning method. Estimates of heritability ranged mostly from 20 to 50 per cent, indicating that fairly rapid progress could be expected in breeding for rust resistance. The possibilities of tetrasomic inheritance of rust reaction, linkages between genes for self-incompatibility and rust reaction, and genotype environmental interactions were factors that could neither be discounted nor the effect determined.

108 pages. \$2.00. Mic 57-1129

ANALYSIS AND INTERPRETATION OF VARIATION OF INBRED LINES AND F_1 CROSSES IN CORN

(Publication No. 20,181)

Therese Marie Kelleher, Ph.D. North Carolina State College, 1956

Supervisor: Harold Frank Robinson

The study of inbred parents and hybrid offspring was approached through two methods, a regression procedure in which a particular functional relationship is postulated for parents and offspring and a component of variance procedure in which the variance among parents and among progenies is separately partitioned into hereditary, environmental and interaction components. The manner in which hereditary, environmental and interaction effects enter into the regression procedure was determined. The composition of the quantities estimated in both procedures is given for different genetic situations and the extendibility of the approaches to handle more complex genetic situations is discussed.

Data from two samples of inbred lines of corn and the offspring obtained by randomly mating the lines were available for two characters, plant height and yield. The parents and progenies were grown in a sample of environmental conditions. The data were used to illustrate the various points of analysis and, insofar as possible, to evaluate the possible uses of the methodology in the study of quantitative inheritance in corn and other organisms.

The results were compared to estimates available in the original populations and it was found that the usefulness of characterizing variety populations through the use of hybrid populations, is dependent upon the manner in which the parent lines were derived from the varieties.

The general conclusion from the experimental comparisons of the two approaches was that the regression approach is more dependent upon assumptions which are often not fulfilled in experimental situations because data from two generations, i.e. inbred and hybrids, are treated in the same analysis. In the event that reasonable measures of performance are obtained from both parents and offspring the regression analysis is a useful addition to methods of analysis of quantitative data, but it must be supplemented by a component analysis for any realistic appraisal of data.

113 pages. \$2.00. Mic 57-767

PHENOTYPIC DIFFERENCES WITHIN LATE FEATHERING CHICKS AND ESTIMATES OF HERITABILITY WITHIN EARLY FEATHERING CHICKS

(Publication No. 20,362)

Paul Benjamin Siegel, Ph.D. Kansas State College, 1957

This study was initiated (1) to provide more information about the phenotypic expression of the sex-linked gene for late feathering and (2) to estimate heritabilities, sex differences, and phenotypic correlations for six feathering traits within early feathering chicks.

The stock used in the first phase consisted of 615 Rhode Island Red chicks obtained during a two year period from matings of homozygous late feathering males to both hemizyous early and late feathering females. Chicks from such matings were identified by pedigree as either homozygous (KK), heterozygous (KK), or hemizygous (K-) late feathering. All birds were classified according to degree of feather development at hatching, 12 days, 3 weeks, and 5 weeks of age.

Comparisons between homozygous males and hemizygous females showed highly significant differences at all four ages each year. The differences found between homozygous and heterozygous males were also highly significant. In both cases the homozygotes were poorer feathered than either the heterozygotes or hemizygotes. Generally, the differences between the heterozygous males and the hemizygous females were not significant. Since homozygotes possess two K genes in contrast to only one for the heterozygous and hemizygous chicks, it appeared that there was a dosage effect. Prior to the start of the experiment phenotypic standards were set for differentiating between homozygous and heterozygous males at each of the four ages. Based on these criteria, genotypes were determined from phenotype with an accuracy ranging from 80 to 89 percent depending on the age of differentiation.

Early feathering White Plymouth Rocks were used in the second phase of this study. Heritability estimates, sex differences, and phenotypic correlations were computed for the degree of feather development in the breast pterylae at ten days, the amount of feathering on the back at ten days, five weeks, and seven weeks, the number of pinfeathers in the sheath stage found in the back area at ten weeks, and the amount of body down present at the same age. Additional information was sought on the interrelationships between feather development and body weight and between feather development and the histology of the thyroid gland.

Heritability estimates were moderate (.25 - .40) to high (>.40) for all traits measured, indicating that improvement in degree of feathering could easily be made through mass selection in populations already possessing the sex-linked gene for early feathering.

Sexual dimorphism with females being better feathered than males was found in 34 of 40 comparisons with 15 of the differences being significant.

Significant positive correlations were obtained between ten day, five week, and seven week measurements. The positive correlation between ten week pinfeather and down scores was significant. Negative, and in most instances significant, correlations existed between ten day, five week, and seven week measurements and the ten week scores. These correlations indicate that chicks which feather rapidly during the first few weeks of life have fewer pinfeathers at ten weeks.

No differences were found between ten week body weights of chicks in two lines which differed significantly in feather development. Also, histological results indicated that the thyroid glands were not affected by selection for feather development. 99 pages. \$2.00. Mic 57-768

HERITABILITY ESTIMATES OF BODY WEIGHT,
GAIN, FEED CONSUMPTION, AND FEED
EFFICIENCY, AND THE GENETIC, ENVIRONMENTAL,
AND PHENOTYPIC CORRELATIONS BETWEEN THESE
TRAITS IN NEW HAMPSHIRE BROILERS

(Publication No. 20,175)

Charles Hill Thomas, Ph.D. North Carolina State College, 1956

Supervisor: Dr. Edward Walker Glazener

Heritability estimates were computed for weight at four, six, eight, and ten weeks of age and for gain, feed consumption, and feed efficiency during the four to six, six to eight, eight to ten, four to eight, four to ten, and six to ten week periods. Heritability estimates computed from the sire component of variance were .56, .67, .85, and .31 from the analysis of ten week weight, four to ten week gain, feed consumption, and feed efficiency respectively. Heritability estimates for weight, gain, and feed consumption for the other periods were generally high; whereas the estimates for feed efficiency were usually low. Heritability estimates computed from the sire component of variance were generally higher from the analysis of females than males; whereas, those estimates from the dam component were usually higher from the analysis of males than females. Heritability estimates from the dam component were higher than estimates from the sire component from the analysis of males; however, heritability estimates from the sire component were generally higher than estimates from the dam component from the analysis of females. It was assumed that these differences in heritability estimates are the result of the failure of the dam to

contribute a sex chromosome to her female progeny and the constant contribution of a sex chromosome to her male progeny.

The correlations between weights at different ages were high and positive. Genetic and phenotypic correlations between feed consumptions during different periods were high and positive, but the environmental correlations were usually low. The correlations between feed efficiencies during different periods were generally positive and low. The correlations between feed consumption and gain during various periods were generally high and positive. Genetic correlations between feed efficiency and gain were negative and low for most periods while the phenotypic and environmental correlations were high and negative during most periods. Genetic and phenotypic correlations between feed consumption and feed efficiency were positive and low for most periods; whereas, the environmental correlations were negative and small. The high positive genetic correlations between feed consumption and gain indicate that if selection is based on gain there will be an increase in feed consumption; however, the low genetic correlation between feed efficiency and gain indicate that selecting for gain will have very little influence on feed efficiency, although an improvement in feed efficiency would be expected as the length of the growing period is reduced. The high genetic correlations between weights at different ages indicate that weights taken at any age between six and ten weeks will be a satisfactory index for evaluating growth to ten weeks of age.

It was found that the carcasses of males contain a lower per cent ether extract than females and that birds with good feed efficiency contain a lower per cent ether extract than birds of the same sex that have poor feed efficiency. These differences in per cent ether extract are probably under the control of hormones.

Selection indexes which were constructed using four to ten week gain, feed consumption, and feed efficiency indicated that approximately six per cent greater progress could be made if selection were based on gain to a constant weight and feed efficiency and approximately four per cent greater progress could be made if selection were based on gain to a constant age and feed consumption rather than selecting on gain alone. The additional progress is so small that the cost of determining feed consumption or feed efficiency would probably preclude the use of these characters in a selection program.

137 pages. \$2.00. Mic 57-769

A STUDY OF THE EFFECTS OF MANGANESE ON THE FORMATION AND STATUS OF CERTAIN HIGH-ENERGY PHOSPHATE COMPOUNDS IN PLANTS

(Publication No. 20,185)

Irvin Charles Anderson, Ph.D. North Carolina State College, 1957

Supervisor: Harold J. Evans

Studies were made of the adenosine triphosphate (ATP) status of plants grown with various levels of manganese (Mn) from deficient to toxic. These studies provided some evidence which indicated that Mn-deficient plants contained less ATP than normal or Mn-toxic plants. Attempts were made to link these results to the effects of Mn on oxidative phosphorylation and on photosynthetic phosphorylation. The oxidative decarboxylation of isocitrate, an intermediate of the citric acid cycle, has been reported to require Mn. It was hypothesized that a limitation of this and similar reactions of the citric acid cycle by a deficiency of Mn would account for a reduced ATP content of Mn-deficient plants.

Assays were made of glutamyl transferase activity of root and leaf extracts from lima bean plants grown with various levels of Mn from deficient to toxic. This enzyme requires catalytic concentrations of either ATP or adenosine diphosphate. Enzyme activities of extracts from Mndeficient tissues were increased two-fold by the addition of ATP during assaying. The responses to added ATP decreased with additions of Mn to culture solutions. Extracts from Mn-toxic plants were essentially fully active without exogenous ATP. Studies were made which showed that the effect of Mn-culture treatment on the responses of glutamyl transferase activity to ATP additions was not due to a differential effect of Mn-culture treatment on the rate of destruction of endogenous high-energy phosphate.

Adenosine triphosphate of leaves from plants grown with various levels of Mn was isolated by alcohol and barium fractionation followed by separation of the different phosphate fractions on a resin column. Adenosine triphosphate of the ATP fractions was measured by phosphorus analysis and by intensity of light absorption at 260 millimicrons. These measurements indicated that Mn-deficient plants contained a reduced ATP content. The spectrophotometric assay indicated 70 percent as much ATP as the chemical method. Enzyme assays for ATP content of the fraction indicated that 71 percent of the phosphorus of the ATP fraction consisted of ATP.

Attempts were made to measure the effect of Mn-culture treatment on the rate of incorporation of inorganic phosphate into ATP by applying radioactive phosphate to culture solutions and measuring specific activities of certain phosphate compounds of leaves. The specific activity of phosphorus of the ATP fraction was approximately three times greater than that of inorganic phosphate. This appeared to be due to dilution of the inorganic phosphate

fraction by non-true inorganic phosphate with a relatively low specific activity and to heterogeniety of the inorganic phosphate pool. These studies indicated that the turnover time of the ATP pool was very rapid.

Studies were made of the Mn and magnesium (Mg) requirement for oxidative phosphorylation by mitochondria from etiolated pea stems with citrate and isocitrate as substrates. The magnitude of the interaction between Mn and Mg additions indicated a specific beneficial effect of Mn for oxidative phosphorylation. Phosphorylative and oxidative activities of reaction mixtures containing optimal Mg was frequently increased by the addition of Mn. Triphosphopyridine nucleotide (TPN+) had no effect on oxidative phosphorylation with citrate, but decreased oxygen consumption without affecting phosphorylative activity when isocitrate was used as substrate. This was ascribed to oxidation of isocitrate without concomitant phosphorylation by mitochondrial debris when TPN+ was added.

There was no appreciable beneficial effect of Mn for photosynthetic phosphorylation with isolated chloroplasts from spinach leaves. 114 pages. \$2.00. Mic 57-770

FLUORESCENCE LIFE TIMES OF PHOTOSYNTHETIC PIGMENTS IN VIVO AND IN VITRO

(Publication No. 19,802)

Seymour Steven Brody, Ph.D. University of Illinois, 1956

An instrument to measure the fluorescence decay of pigments with excitation life times of the order of millimicroseconds (m μ sec.) was constructed. A hydrogen flash lamp supplied a pulse lasting \angle 1 m μ sec. The fluorescence induced by this flash was detected with a photomultiplier; the signal from the latter was applied directly to the plates of an oscilloscope, the display photographed, and the fluorescence decay separated from the instrument lag by mathematical analysis presuming the decay to be exponential.

The average fluorescence life times \mathcal{T} of pigments were determined in vitro, and with lesser precision in vivo. The most important of the results are given in the two following tables:

| Pigment | T | (mµse | ec.) |
|--|---|-------|------|
| Eosin Y | | 1.6 ± | 0.3 |
| Fluorescein | | 4.8 ± | 0.3 |
| Phycoerythrin in phosphate buffer (ph 6.0-6.2) | | 7.1 ± | 0.5 |
| Phycocyanin in phosphate buffer (ph 6.0-6.2) | | 1.8 ± | 0.6 |
| Chlorella | | 1.6 ± | 0.5 |
| Anacystis | | 1.2 ± | 0.4 |
| Porphyridium | | 1.5 ± | 0.4 |

| Solvent | Chlorophyll a T (mµsec.) | Chlorophyll b | $\begin{array}{c} \text{Methyl Chlorophyllide}(\underline{a}+\underline{b}) \\ \mathcal{T} \ (\underline{m}\mu\underline{sec.}) \end{array}$ |
|-------------|--------------------------|---------------|--|
| benzene | 7.8 ± 0.5 | 6.3 ± 0.4 | 6.7 ± 0.4 |
| ethyl ether | 5.1 ± 0.4 | 3.9 + 0.4 | 4.8 + 0.4 |
| methanol | 6.9 ± 0.4 | 5.9 ± 0.4 | 6.5 ± 0.4 |

The measured actual life times of chlorophylls in vitro, combined with the natural life time \mathcal{T}_0 calculated by integration of absorption curves, permit by means of the equation $\mathcal{T} = \mathcal{T}_0 \phi$, to check the fluorescence yields ϕ as found by Forster (Thesis, University of Minnesota, 1951), and by Latimer (Thesis, University of Illinois, 1956); they support the values obtained by the latter.

In conjunction with fluorescence yields, and the known specific absorption coefficients of the phycobilins, the fluorescence life times were used to calculate the number of chromophores attached to each protein unit (which is still uncertain because much of the chromophore is destroyed in chemical separation from the protein). This procedure showed that there are 26 ± 8 chromophores on each phycocyanin molecule (molecular weight 273,000), and as many as 70-100 chromophores on each phycoerythrin molecule (molecular weight 270,000).

The difference between the fluorescence yield ($\sim 10\%$) calculated from the measured life time of chlorophyll in vivo (assuming \mathcal{T}_0 to be the same as in vitro), and the same yield determined directly by Latimer (2-3%) requires interpretation. One possibility is to assume two forms of chlorophyll in vivo (for which some spectroscopic evidence has been obtained by other investigators), of which only one is fluorescent. An alternative is to attribute the discrepancy to different conditions of illumination and pre-illumination.

It proved possible to observe the delay in the onset of sensitized fluorescence in vivo, by comparing the time courses of directly excited chlorophyll fluorescence and of the same fluorescence excited by energy transfer from phycoerythrin. This delay was of the order of 0.5 mµsec. — in good agreement with the value calculated from the measured life times of the pigments in vitro, the energy transfer efficiency, and the fluorescence yields in vivo.

From the fluorescence life time in vivo, an estimate was made of the maximum number of chlorophyll molecules an absorbed quantum can visit in vivo before being emitted as fluorescence, or dissipated by a non-radiative process. A tentative conclusion is that this number is of the order of 1500. The number of different chlorophyll molecules visited during a (two dimentional) random walk of this length is about 270. 94 pages. \$2.00. Mic 57-771

CHEMICAL AND PHYSICAL FACTORS DETERMINING DEVELOPMENT OF APOTHECIA IN THE HOMOTHALLIC FUNGUS PYRONEMA OMPHALODES

(Publication No. 20,227)

Ernest Julian Bubieniec, Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor Paul J. Allen

The objective of this investigation was to discover the chemical and physical factors that markedly affect sexual

reproduction in <u>Pyronema</u> <u>omphalodes</u> (Bull. ex Fr.) Fckl. (<u>pyronema confluens</u> Tul.) and thereby to gain some insight into the metabolic basis of reproduction in this fungus.

The effects of the various factors were determined employing single-spore cultures grown on synthetic media under controlled conditions of temperature and illumination. Claussen's double-dish method of culture yielded the most reproducible results. Variations in response to given conditions occurred among strains as well as among single-spore isolates of individual strains of this homothallic fungus.

The efficacy of heat in converting soil into a substrate favorable for reproduction of this organism was shown not to be related to its sterilizing effect. Experiments with concentrated aqueous extracts of heated soil suggested that the basis for the favorable quality of heated soil may be a major nutrient such as the carbon source. In single-dish cultures, low concentrations of sucrose and of inorganic nitrogen compounds favored reproduction whereas higher concentrations of either favored vegetative growth.

Diphenylamine, at concentrations of 8.4 and 16.9 x 10^{-5} M, strongly inhibited carotenogenesis, allowed the formation of antheridia and ascogonia but did not permit their fusion and subsequent development. At concentrations of 2.1 and 4.2×10^{-5} M, diphenylamine allowed the formation of apothecia with subnormal numbers of asci. Both effects of 8.4×10^{-5} M diphenylamine were partially counteracted by 1.3×10^{-5} M riboflavin. Reproductive development of diphenylamine-treated cultures exposed to adequate illumination was very similar to the development of nontreated cultures incubated under suboptimal conditions of illumination.

Light is essential for reproductive development but not for vegetative growth of P. omphalodes. Reproductive development occurred over a wide range (11-860 footcandles) of intensities of white light and undetermined wave-lengths in the range of 320-590 mµ were effective in inducing the formation of apothecia. The vegetative mycelium of P. omphalodes becomes sensitive to the morphogenetic effects of light only after its vegetative growth has been checked. Checks to vegetative growth caused by diphenylamine, ultra-violet radiation, or by the mycelium reaching the sides of the culture vessel or the front of another colony of the same isolate were equally effective in inducing this sensitivity. The inhibition of vegetative growth was shown to be a factor in determining the pattern of distribution of apothecia on solid media.

The pigments of light-grown vegetative mycelium were found to be carotenoids, three of which were tentatively identified as α -carotene, λ -carotene and torulene.

These factors are considered to control reproduction through their action on alternative metabolic pathways. Carbohydrate metabolism and light-sensitive reactions are decisive in the reproduction of this fungus.

114 pages. \$2.00. Mic 57-1130

THE EFFECT OF WAVELENGTH ON THE DISTRIBUTION OF C¹⁴ IN THE EARLY PRODUCTS OF PHOTOSYNTHESIS

(Publication No. 19,805)

Theodore Cayle, Ph.D. University of Illinois, 1956

A study was instituted which, it was hoped, would yield information regarding the role of wavelength on the incorporation of C¹⁴ in the early products of photosynthesis.

Chlorella pyrenoidosa Chick (Emerson's strain) were allowed to photosynthesize for thirty seconds in the presence of $C^{14}O_2$, in light consisting mainly of 436 m μ or 644 m μ . The cells were extracted with seventy percent ethyl alcohol and the extracts were fractionated chromatographically in an aqueous phenol solvent to separate the amino acids and phosphate esters. The latter were chemically fractionated into barium soluble-alchol insoluble and barium insoluble residues and the incorporation in these as well as the amino acids was determined as a function of the wavelength to which the cells were exposed. This type of analysis was performed on extracts from cells incorporating $C^{14}O_2$ immediately following a dark period (transient-state photosynthesis) as well as after a period of exposure to light (steady-state photosynthesis).

Photosynthesis during transient-state and steady-state conditions was characterized by a decided favoring of incorporation into the amino acids at 436 m μ compared to 644 m μ . A marked difference in the distribution of C^{14} fixed within the phosphate ester fractions was noted during transient-state photosynthesis at 436 m μ . The distribution reverted to the initial levels during steady-state conditions.

The transient-state data were complicated by the fact that the carbon dioxide tension immediately preceding. the incorporation of the radioactive carbon dioxide was reduced. Evidence was presented relating this to previous observations from other laboratories concerning a proposed cyclic process for the path of carbon in photosynthesis. Data were also presented suggesting that a carbon dioxide burst from an unlabeled reservoir was encountered during transient-state photosynthesis.

The effect of blue light was interpreted as an inhibition of the oxidation of photochemically produced reduced pyridine nucleotide, possibly mediated through a flavin system.

The following amino acids, isolated from cells photosynthsizing in steady-state conditions, were studied at one time or another, listed in the order of decreasing activity: alanine, glycine, serine, β -alinine, glutamic acid, valine and leucine.

Alanine and glycine were degraded and it was concluded that the former arose from phosphoglyceric acid, probably through pyruvic acid. Blycine, on the other hand, was formed via an entirely different pathway. The heavy label found in the alpha carbon of glycine indicated that carbon dioxide could have been converted to glycine by way of formate and gloxylate.

111 pages. \$2.00. Mic 57-772

TOBACCO ANTHRACNOSE: ETIOLOGY, SOURCES OF RESISTANCE, AND HOST-PARASITE RELATIONSHIPS

(Publication No. 20,188)

Khalid Abdulkadir Debbagh, Ph.D. North Carolina State College, 1957

Supervisor: Charles Joseph Nusbaum

Tobacco anthracnose has been one of the major fluecured tobacco plant bed diseases in North Carolina for the last half decade. Investigators have reported the disease to be caused by four different fungus species in the two related genera Colletotrichum and Gloeosporium. To determine the taxonomic position of the pathogen, comparative morphological and cross inoculation studies were made with Colletotricum species isolated from tobacco, alfalfa, Ladino clover, Korean Lespedeza and hop clover. Those from hop and Lespedeza did not conform to any Colletotrichum described on the leguminous crops studied. The temperature relations of the tobacco, alfalfa and Ladino isolates were essentially identical and the measurements of their conidia from cultures grown on potato dextrose agar respectively were $11.1-17.7(14.5) \times 3.1-4.6(3.8)$, $10.0-17.7(14.7) \times 2.9-4.3(3.7)$ and $12.3-25.7(16.7) \times 2.9-4.8$ (3.7). These three isolates were equally pathogenic to alfalfa, but the tobacco isolate was pronouncedly more so to its natural host than either of the other two. The Ladino isolate caused only pin-point lesions, while the alfalfa isolate in addition caused some typical anthracnose lesions on tobacco. Six successive passages through tobaccofailed to increase the pathogenecity of the last-named isolate to this host. It is concluded that these three isolates represent as many special forms of C. destructivum O'Gara.

In screening 25 Nicotiana species and 193 tobacco lines and varieties for resistance the latter showed varying degrees of susceptibility. N. debneyi, N. glauca, N. langsdorfii, N. longiflora, and N. nudicaulis were highly resistant, whereas N. megalosiphon, N. palmeri, N. stocktoni, and N. sylvestris were moderately resistant. The other 16 species were susceptible. F₁ hybrid plants from N. tabacum x N. sylvestris were intermediate between the parents for resistance. Those from crosses involving N. tabacum and N. glauca were highly resistant when they carried one genome from each parent but only moderately so when they had two genomes from a tetraploid glauca

Conidia on D.B. 101 leaves germinate by short germ tubes which give rise to dark-brown appressoria. Infection pegs from the latter penetrate the host directly. After reaching intracellular cavities, the fungus forms stout primary mycelia which may be globoid or stellate. They frequently possess few-septate thick processes from which secondary hyphae grow. In all cases studied the pathological effects of the fungus were exerted in advance of colonization. The first microscopic disease symptoms are the swelling and deep staining of cell walls and the granular degeneration of nuclei. Subsequently cell contents degenerate to a mass of small vacuoles surrounded by a mesh of cytoplasm. Vessels are less affected than parenchyma and can be recognized after all the surrounding tissue has 109 pages. \$2.00. Mic 57-773 been killed.

CYTOLOGICAL STUDIES IN SAINTPAULIA WENDL. (GESNERIACEAE)

(Publication No. 18,925)

Howard George Ehrlich, Ph.D. University of Minnesota, 1956

Since their discovery in 1890 and their introduction to this country in 1936, relatively little cytological work has been done on the African violets. The recent interest in the genetics of this plant has made cytological investigation of it desirable. The present investigation was undertaken, therefore, to explore this new experimental material, discover facts of cytological interest, and provide a cytological basis for future genetical interpretations.

A comparative cytological analysis of the diploid Saint-paulia ionantha Wendl., as a standard of reference, and its related tetraploid S. ionantha "Amazon" was made. Standard cytological techniques were used. The diploid chromosome number of 30 for S. ionantha was confirmed and 2n = 60 was newly established for S. ionantha "Amazon".

Although the diploid displayed a high degree of normal meiotic behavior, a small amount of irregularity was found. This included evidence of an inverted chromosome segment, crossing-over in the inverted region, and evidence of a small translocation. Tentative cytological pachytene chromosome maps of the 15-pair chromosome complement of S. ionantha were prepared. It is expected that with diligent care it will be possible to use these in eventual cytogenetical interpretations. An over-all chromomere size gradient was indicated. A single nucleolus organizer chromosome with two small satellites was found and the organizer region was apparent. Few other conspicuous reference points were evident.

The tetraploid showed a high degree of meiotic abnormality including lagging bivalents and univalents. Evidence was found for multivalent pairing and lack of pairing, chains as long as 10 chromosomes, and rings of as many as 8 chromosomes; but rings, crosses, and chains of 4 chromosomes were most frequent. Evidence was also found for the presence of an inverted chromosome segment and crossing-over in the inversion, a deletion or duplication, and two different translocations.

Normal quartets in both the diploid and tetraploid were typically tetrahedral. Abnormal quartets reflected meiotic abnormalities and in general their frequency was in harmony with what may be expected from the data on meiotic behavior. Abnormal quartets contained microspores varying in number from 1-6 in the diploid and 1-11 in the tetraploid. These microspores varied in size and contained varying and reduced amounts of chromatin, sometimes none being evident. All microspores showed an apparently similar wall, however.

A tendency toward observable normalcy during the course of development was noted in the tetraploid. Observations on sterility indicated at least 1% in the diploid and approximately 40% in the tetraploid but greater functional sterility was assumed.

Normal pollen grains of the diploid were tricolporate. The normal pollen of the tetraploid was, however, typically tetracolporate with only approximately one-fourth of the pollen being tricolporate. It was concluded that this furrow variation was due largely to the multiplication of genes by polyploidy and an alteration of their balance due to meiotic abnormality.

The sizes of the tricolporate and tetracolporate pollen of the tetraploid were similar but both were larger than the tricolporate pollen of the diploid. They were, however, less than twice the size. All pollen grains were suboblate in shape.

84 pages. \$2.00. Mic 57-774

AUTECOLOGICAL STUDIES OF ARTEMISIA TRIDENTATA NUTT.

(Publication No. 17,506)

DuWayne LeRoy Goodwin, Ph.D. State College of Washington, 1956

Studies were made of the disseminule, seedling and mature plant. Wind dissemination and germination were also investigated. Studies were conducted in the laboratory, greenhouse and field.

Dimensions of the disseminule, obtained by averaging measurements of material from three stations, were 0.69x 1.43 mm. Individual disseminules weigh about 0.21 mg. Although no special mechanism for dissemination was discernible, the disseminule may become attached to passing animals. Maximum distance of wind dissemination was 33 m. Dissemination began in October and continued until January.

Germination occurred readily without pretreatment but was increased by moist stratification at 2°C. Temperatures above 25°C inhibited germination. Germination did occur at temperatures of 5-7°C and when disseminules were submerged in water. Most uniform germination and at highest percentages was obtained when the germinator temperature was 17-19°C under normal daylight. Field germination began the first week of February and ceased in April.

Root systems of seedlings continued to develop even though air temperature was below freezing. During their active growth period, root systems of associated winter annuals exceeded that of big sagebrush seedlings. Aerial growth of seedlings did not become noticeable until air temperature began a steady climb. This growth coincides with initiation of twig growth on mature plants.

The production, each season, of two sets of foliage results in the evergreen habit of the plant. One set of foliage appears as the apical buds resume growth. In the axils of these leaves, short lateral branches bearing the second set of foliage develop. The first leaves absciss as the second leaves mature. Leaves of the second set are usually smaller than the first and persist until the following spring.

Floral buds are evident in July, turn yellow as they expand in August, and begin to open in September. Moisture conditions of the site influence phenology. There was some evidence that big sagebrush is a long-day plant.

The root system is amazingly variable. On deep well aerated soil, a taproot with few lateral roots may develop. When the soil is shallow and contains a hardpan, a root system of many widely branching laterals without the dominant taproot may be found. 79 pages. \$2.00. Mic 57-775

AN HISTOLOGICAL STUDY OF THE ORIGIN AND DEVELOPMENT OF INSECT INDUCED GALLS OF THE GOLDENROD BLOSSOM

(Publication No. 18,247)

Sister M. Gabrielle Mazelauskas (Maze) O.S.F., Ph.D. University of Pittsburgh, 1956

The galls considered in this study are complex botanical structures resulting from the interaction of a plant and an animal. Galls are most important to the makers because they furnish them with food and shelter. The relationship of the gall-maker to the hosts, so far as is known, is parasitic. The plant receives no benefit from the gall except that it protects itself from a more serious injury by producing this abnormal growth.

The ability to stimulate the growth of galls has been developed, to a great extent, in one group of specialized mites and among a number of insects. The principal gall-producers are found among the plant mites (Acarinae), the plant lice (Aphididae), including the jumping-lice (Psyllidae), the gall midges (Itonididae), and gall wasps (Cynipidae) - the first and the last two being the chief gall-producers (Maze 1949).

During a field trip in the summer of 1949, the author first recognized the galls on the blossoms of the goldenrod. Interest grew as to the probable makers of these galls. In one case it took three years to detect an insect emerging from a gall. The "sessile" galls, Rhopalomyia fusiformis Felt were found in Chicago, Illinois, and also in Pittsburgh, and Dallas, Pennsylvania; and during the summer of 1955 specimens of the "stemmed" galls, Rhopalomyia pedicellata Felt were collected at Dallas, Pennsylvania. The author has not yet found any of this species of galls in Pittsburgh. A similar type of galls was collected on Maple leaves at Monongahela, Pennsylvania.

Since so little work has been done on the flower galls of the goldenrod and since no histological study has been done on the Solidago graminifolia and Solidago juncea galls initiated by Rhopalomyia species, the author has made a study of the "stemmed" and "sessile" galls of the abovementioned species found on various organs of the plant.

Because of the diverse points of origin in the plant, it was of interest to determine whether they were of a uniform histological structure throughout the plant. The author also wished to identify the initiators, inquilines, and parasitoids of these plants.

This study shows that galls on Solidago graminifolia are produced on flowers by the species of Rhopalomyia insects. The observations from this study may be summarized as follows:

- 1. Flower galls on Solidago graminifolia and Solidago juncea were initiated in meristematic cells of the stem below the inflorescences, and in the inflorescences themselves. Galls were found on flowers, stems, leaves, the upper surface of receptacles, and on vegetative buds.
- 2. Insects making them were identified as Rhopalomyia fusiformis Felt, for the sessile type; and Rhopalomyia pedicellata Felt, for the stemmed type.
- 3. Parasitoids belonging to Hymenoptera (Chalcidoidea: Torymidae) Torymus sp.; (Chalcidoidea: Eurytomidae) Rileya sp.; and (Proctotrupoidea: Platygasteridae) Platygaster sp. were found in both of the galls.

- 4. A new species of Asphondylia, an inquiline, was found on the sessile gall.
- 5. In their anatomical structure the galls resembled the stem anatomy. However, sclerenchyma was less extensively developed in the galls and in it the resin canals were larger and more abundant.
- 6. The galls can be initiated on any of the reproductive or vegetative parts of the plant by R. fusiformis Felt and R. pedicellata Felt.
- 7. Galls produced by each of these insects are identical in structure no matter on what part of the plant they occur.
- 8. The maple-spindle gall on Acer saccharinum leaves was formed by a mite, Phyllocoptes aceris-crumena Riley.

The developing gall described in this paper follows Küster's "Umwallungen" type of gall formation and was prosoplasmatic in character.

In conclusion, therefore, the writer has found that the "sessile" and "stemmed" galls studied belong in the general group of heteroplastic tissues and because of their histological characteristics, these galls were placed more specifically in the category of prosoplasmas according to Küster's classification. 125 pages. \$2.00. Mic 57-776

STUDIES ON THE MANGANESE NUTRITION OF CHLORELLA, WITH SPECIAL REFERENCE TO NITROGEN METABOLISM

(Publication No. 20,426)

Gerald Seymour Reisner, Ph.D. Cornell University, 1956

Investigations were made on the growth, amino acid distribution and fatty acid content of <u>Chlorella</u> under several treatments. These included 1) normal and deficient manganese supply, 2) ammonium and nitrate nitrogen source, 3) autotrophic, mixotrophic and heterotrophic carbon nutrition. In addition, comparisons were made between the growth and soluble amino acid fraction of <u>Chlorella</u> under manganese toxicity and iron deficiency.

It was found that manganese was essential to the growth of Chlorella under all of the treatments listed above (1,2, and 3). Chlorosis occurred only under nitrate nitrogen and manganese deficiency and under all forms of heterotrophic growth. The major amino acid variations in response to manganese deficiency were a lowering of glutamic acid and alanine and an increase in arginine and gamma amino butyric acid. The main difference between normal cultures supplied with nitrate or ammonium nitrogen was a higher glutamic acid level in the former and a generally higher proline level in the latter. Among the carbon treatments mixotrophic cultures showed amino acid patterns markedly different from the other two carbon treatments. Glutamic acid generally increased with added sugar in the medium.

Under all forms of nitrogen and carbon treatments manganese deficiency induced a raising of the fatty acid level in Chlorella.

Growth and amino acid studies showed that manganese

BOTANY 489

in high amounts can produce both iron deficiency symptoms and symptoms stemming from a direct toxic effect of manganese on Chlorella enzyme systems.

190 pages. \$2.50. Mic 57-1131

THE UPTAKE AND METABOLISM OF POTASSIUM CYANIDE-C¹⁴ AND ACETONITRILE-1-C¹⁴ IN PLANT TISSUES

(Publication No. 19,876)

Armar Archbold Strauss, Ph.D. University of Illinois, 1956

A study of the uptake and metabolism of two unsubstituted, aliphatic nitriles in plant tissues has been made to test the possibility that these compounds might be intermediary products of normal nitrogen metabolism. Acetonitrile- $1-C^{14}$ was synthesized on a ten millimole scale from sodium acetate- $1-C^{14}$ using a three step procedure which involved formation and subsequent reduction of acetamide- $1-C^{14}$ with ammonium sulphamate.

The plant materials used in most feeding experiments were etiolated corn and pea seedling tissues. In one acetonitrile experiment etiolated cucumber, okra, tomato and radish seedlings were used. The experimental tissue consisted of 3 mm. sections taken from the 1.0 - 1.5 cm. region immediately below the epicotyl-arch of the pea seedlings, and a comparable region in the cucumber and okra plants. Sections of an equal length of stem surrounding the growing point of the corn plants were used, and the radish and tomato stems were used with only the cotyledons removed. Several grams of the experimental tissues incubated in pH 6.8 potassium cyanide-C¹⁴ solutions at

concentrations slightly greater than $10^{-4}\,\mathrm{M}$ were aerated by a stream of carbon dioxide-free air for intervals between five minutes and five hours. In the acetonitrile-1-C¹⁴ experiment a similar procedure was used, although the experimental solution concentrations were slightly greater than $10^{-3}\,\mathrm{M}$.

Preliminary respiration measurement with corn and pea sections showed that a cyanide concentration of 10-3 M was unihibitory to pea stem sections and only slightly inhibitory to the corn tissue. At $7.5 \times 10^{-4} M$ no inhibition of respiration was observed in either case. On the basis of the data recorded using the radioactive cyanide its metabolism by the above mentioned tissues can be concluded. Isotopic carbon measurements of several cellular components indicate the intracellular incorporation of cyanide carbon in pectin, pectin alkoxyl groups, total saponifiable and nonsaponifiable matter as well as the extracellular release of active carbon dioxide. The small incorporation of cyanide carbon into only two amino acids, namely, asparagine and glutamic acid, is anomalous and may be the result of a secondary effect, i.e., the fixation of carbon dioxide.

The ability of both corn and pea tissues to metabolize acetonitrile-1-C¹⁴ indicates that this compound as well as cyanide may be a normal metabolic constituent. Isotopic carbon was found in released carbon dioxide, saponifiable and non-saponifiable matter, and pectin, but no evidence of incorporation into amino acids was obtained. The failure to detect isotopic carbon of acetonitrile origin in the several amino acids suggests that the oxidation of this substance was not rapid enough during the experimental interval for the fixation of any radioactive carbon dioxide evolved. In no experiment was the rate of acetonitrile metabolism in the plant tissue as great as in a comparable cyanide determination, although it was administered in considerably higher concentration.

115 pages. \$2.00. Mic 57-777

CHEMISTRY, GENERAL

THE PROPERTIES AND STRUCTURE OF SOME DIETHYLENETRIAMINE COBALT COMPLEXES

(Publication No. 18,749)

Philip Hastings Crayton, Ph.D. The University of Buffalo, 1956

A series of bis complexes with various hexacoordinate metals has shown diethylenetriamine to be a strong tridentate coordinating agent. In the present investigation a series of cobalt compounds were prepared containing one molecule of diethylenetriamine; [Co dien(SCN)₃], [Co dien(SCN)₃], [Co dien(SCN)₃], [Co dien(NO₂)₂Cl], [Co dien(NO₂)₂Cl], [Co dien(NO₃)₃], [Co dien(H₂O)₂ClO₄] (ClO₄)₂ H₂O. These compounds were found to be very stable and showed an unusually strong resistance to the entrance of propylenediamine and ammonia.

Construction of Fisher-Hirchfelder models indicated that the primary amine groups in diethylenetriamine can occupy either cis or trans positions. Diethylenetriamine trinitrocobalt(III) was prepared from cobalt nitrate, trans triamminetrinitrocobalt(III) and sodium cobaltinitrite. There was no variation of spectrum with different methods of preparation. The spectrum corresponded to that of trans triamminetrinitrocobalt(III). Diethylenetriamine trinitrocobalt(III) could not be prepared by the action of diethylenetriamine on cis triamminetrinitrocobalt(III). These reactions indicated that the trans structure was strongly favored.

The spectrum of the complex resulting from the replacement of one nitro group from diethylenetriamine trinitrocobalt(III) indicated that the remaining two nitro groups occupy trans positions. This reaction is a contradiction of the trans effect.

The spectra of the hydrolysis products of diethylenetriamine trichlorocobalt(III) were obtained but could not be correlated with those four known triammine-chloroaguo complexes.

The destruction of nitrite in diethylenetriamine trinitrocobalt(III) by acids led to the formation of new diethylenetriamine complexes even when hot strong acids were used. A strong tendency to coordinate the anion of the acid rather than water was observed. When perchloric acid was used one perchlorate group coordinated to the cobalt although perchlorate is considered to be a very weak coordinating group. 63 pages. \$2.00. Mic 57-778

A STUDY OF THE INTERACTIONS OF POLAR ORGANIC MOLECULES WITH METAL AND METAL OXIDE SURFACES

(Publication No. 20,309)

Anthony Vincent Fraioli, Ph.D. Lehigh University, 1956

A novel volumetric adsorption apparatus has been designed and constructed to measure the adsorption of organic vapors onto metal and metal oxide surfaces. The apparatus employs mercury cut-offs to confine the vapors in the system, and a Puddington gage to measure vapor pressures down to one micron. The Puddington gage was modified to make it more suitable for continuous operation.

Adsorption isotherms have been measured for a number of systems which include water, ethyl alcohol, butyl chloride, and nitropropane as adsorbates on the surfaces of reduced iron, surface oxidized iron, bulk iron oxide, and rutile TiO₂. The isosteric heats of adsorption of ethyl alcohol on surface oxidized iron and the apparent crosssection of the molecule at monolayer coverages indicate that the ethyl alcohol covered the surfaces of surfaceoxidized iron, rutile, and bulk iron oxide with a liquid-like monolayer.

Phase changes were observed on the adsorption of ethyl alcohol on surface amalgamated reduced iron. It has been proposed that such a surface satisfies the a priori criterion of surface homogeneity required for phase change phenomena. No such transitions were noted in the adsorption of ethyl alcohol on surface oxidized iron or bulk iron oxide. The unusual observation of the drop in pressure to a pseudo-equilibrium value, followed by a slow rise to the true equilibrium pressure in the region of the phase changes, has been explained in terms of a change from vertical to horizontal packing in the adsorbed film.

The surface of an iron oxide powder was investigated by water adsorption and calorimetric measurements. Two-thirds of the surface was found to adsorb water physically in the region where monolayer coverage is normally encountered. The remainder of the surface chemisorbed water which was released only by activation at temperatures of 450° C. The average heat of hydration of the chemisorbed water was found to be about -24 kcal. per mole of water. Evidence for the release of internal water and other gases at elevated temperatures was found. In addition, thermodynamic calculations of the entropy of the physically adsorbed water film on iron oxide at 25° C. showed that the water in the first layer had the properties of ice.

Four different vapors were studied by adsorption onto ferric oxide. The percent irreversible or chemical adsorption was measured in each case; for the portion of the surface undergoing physical adsorption, values for the spreading pressure and the work of adhesion were measured. The values of the work of adhesion were expected to correlate with the results of the friction measurements. No such correlation was found.

The relative lubricating efficiency at room temperature of a variety of organic boundary films deposited by vapor adsorption have been measured with a specially designed and built friction apparatus. The apparatus consists of a steel tubular slider and a steel rod enclosed in a pyrex glass envelope to permit control of the vapor adsorption onto the rubbing surfaces. Friction isotherms have been determined for the coefficient of friction vs. the equilibrium pressure of the adsorbed phase. The lubricant molecules include normal and tertiary butyl alcohol, butyraldehyde, butyl chloride, 1, 2, dichloroethane, ethyl alcohol, heptane, and water.

The coefficient of friction was found to decrease with increasing amounts adsorbed to a minimum in the region of monolayer coverage. A linear correlation has been developed between the molar polarization of the bulk liquid of the adsorbed vapor, and the coefficient of static friction μ . It is proposed that in this system at room temperature the polar van der Waal's forces are the important variables in the adhesion of the physically adsorbed film, and that they are involved in the mechanism of lubrication.

85 pages. \$2.00. Mic 57-779

EFFECTS OF RING SIZE ON ADDITION REACTIONS OF METHYLENECYCLOALKANES

(Publication No. 18,744)

Octavius Santos Pascual, Ph.D. Louisiana State University, 1956

Supervisor: Dr. James G. Traynham

Brown, Brewster and Shechter (J. Am. Chem. Soc., 76, 467 (1954)) emphasized the importance of ring strain in cyclic systems. They suggested that a change in the coordination number of a ring carbon atom from 4 to 3 (or sp³ to sp²) may either increase or decrease the number and degree of unfavorable conformations in the system. Reactions involving this change will be sterically hindered in the 4- and 6-membered ring systems and sterically facilitated in the 5- and 7-membered ring systems. Although the above generalization can account for numerous previously unexplained phenomena such as the equilibria involving exo- and endo-double bond isomers and the direction of olefin formation in terpenes, some studies (Dreiding and Hartman, J. Am. Chem. Soc., 78, 1216 (1956)) suggest the desirability of further experimental study to test its general utility and applicability.

The following addition reactions to a series of methylenecycloalkanes (methylenecyclobutane, methylenecyclopentane, methylenecyclohexane and methylenecycloheptane) were selected for investigation:

- 1. The ionic and free radical additions of hydrogen bromide.
- 2. The addition of hypochlorous acid.
- 3. The addition of hypobromous acid.
- 4. The addition of chlorine in the presence and in the absence of extraneous anions.

A related problem (Part 5) involving the reaction of hydrobromic acid with the corresponding methylenecycloalkane oxides (except methylenecyclobutane oxide) was also investigated. The identities of the products (except in parts 4 and 5) were established by comparison of the physical constants and infrared spectra of the addition products with authentic samples prepared by independent methods. In reactions where mixtures were obtained, the ratio of the products were determined by comparison of the quantitative infrared spectra of various mixtures of the pure compounds with the infrared spectrum of the reaction mixture.

491

The ionic and radical additions of hydrogen bromide were all found to proceed normally, with ionic additions leading to tertiary bromides and radical additions to primary bromides. Apparently, the destabilizing energy due to the formation of intermediates or transition states with a trigonal ring carbon in 4- and 6-membered rings is not sufficient to cause abnormal orientations. Some rearranged products were isolated from the ionic addition of hydrogen bromide to methylenecyclobutane but the isomeric bromomethylcyclobutane was not detected. The side reaction products were attributed to transannular participation within the cyclobutyl ring (Applequist and Roberts, J. Am. Chem. Soc., 78, 874 (1956)).

Both isomeric chlorohydrins were obtained in the addition of hypochlorous acid to methylenecycloalkanes. The composition of the product is in agreement with that predicted by the I-strain theory developed by Brown, Brewster and Shechter; i.e., the 4- and 6-membered ring systems led predominantly to 1-chloro-1-hydroxymethyl-cycloalkanes while the 5- and 7-membered ring systems led mostly to 1-chloromethylcycloalkanols. Obviously, the relief of ring strain is an important factor in determining the orientation of hypochlorous acid addition.

The additions of hypobromous acid to methylenecycloalkanes gave mostly 1-bromo-1-hydroxymethylcycloalkanes (90-99%) with some cycloalkanecarboxaldehyde (except with methylenecyclopentane which gave methylenecyclopentane oxide instead of the aldehyde). Evidences were obtained to show that the side-reaction product came from the bromohydrin rather than vice versa. The exclusive formation of the non-Markownikoff product may be attributed to the great tendency of bromine to participate in neighboring group displacement reactions, to the preference of $S_{\rm N}2$ attack at the least substituted carbon and to repulsion between non-bonded atoms in the transition state due in part to the steric requirements of the cycloalkane ring.

The addition of chlorine to methylenecyclobutane yielded the dichloride in addition to some rearranged products attributed to transannular participation. The addition to the other methylenecycloalkanes gave mainly chloromethylcycloalkenes probably by way of a transient ring intermediate (Lee, Diss. Abstr., XV, 39 (1955)). The products formed in the presence of extraneous anions were attributed either to mass effect or I-strain.

The addition of hydrobromic acid to methylenecycloalkane oxides gave 1-bromo-1-hydroxymethylcycloalkanes and cycloalkanecarboxaldehydes regardless of ring size. The varying amount of aldehyde formed was attributed to I-strain effects in the transition state.

99 pages. \$2.00. Mic 57-780

OXIDATION OF METALS IN THE THIN FILM REGION (Publication No. 20,310)

Yung-Fang Yu, Ph.D. Lehigh University, 1956

Metal powders of nickel, cobalt, and copper were reduced with dry hydrogen, and the oxidation rates were measured at -78°, -22°, 0°, and 26° by gas adsorption techniques. The oxygen chemisorption proceeded in two steps, an initial fast oxidation followed by a slow oxidation. The surfaces could be regenerated for further fast chemisorption by heating the oxide-coated surface in vacuum. Successive oxidations, initially on the reduced samples thereafter on the regenerated surfaces, were carried out on films of from zero to 30 Å thickness.

For nickel and cobalt the extent of the fast chemisorption process was essentially temperature independent, whereas the same process on copper was temperature dependent. The rate of the slow process was found to increase with increasing temperature and pressure of oxygen for all three metals. The degree of regeneration increased with increasing activation temperature, although for oxide-coated copper the effect was so small that no reliable quantitative results could be obtained.

The heats of fast chemisorption of oxygen on the reduced and regenerated surfaces at 25° were measured by a specially constructed calorimeter. On the reduced surfaces of all three metals, the heats fell from a high initial value at zero coverage to a constant value corresponding to their respective heats of formation of the oxides. This plateau extended over a range of several layers of oxide. For nickel and cobalt the heat values decreased again to another plateau corresponding to the heat of adsorption of 0° on the surfaces and some contribution of oxide formation. The heats of adsorption on the regenerated nickel and cobalt surfaces indicated that oxygen adsorbed on the surface chiefly as 0° ions, with some oxide formation.

Application of the theory of Mott and Cabrera of oxide film growth in the very thin film region to the first oxidation on reduced surface, produced reasonable values of contact potential differences and work functions. However, the values obtained for regenerated surfaces were unreasonably high. Reasons of this discrepancy based on a discontinuous step-wise mechanism, and creation of vacancies at the metal-oxide interface have been proposed.

Equilibrium data for oxygen adsorption on the reduced and regenerated surfaces of the three metals were determined at -195°. Four types of adsorbed states were found on the reduced surfaces: oxide formation, adsorption as 0°, strong physical adsorption, and ordinary physical adsorption. Further chemisorption on regenerated surfaces consisted mostly of adsorption of 0° ions.

An oxidation mechanism similar to that formulated by Mott and Cabrera is proposed with several modifications: (1) Direct combination of oxygen and metal to form oxide on the reduced surface is included. (2) The effect of variation of concentration of metal atoms at the metal-oxide interface is considered. (3) A semi-conductor model is superimposed to explain the pressure dependency and the differences between the three metals. (4) Differences between the oxidation of nickel and cobalt compared to that of copper are explained by the predominance of the electrostatic effect for the first two metals.

A mechanism for regeneration based on the destruction of the 0⁻ surface layer and of the vacancies at the metal-oxide interface by activation is proposed.

103 pages. \$2.00. Mic 57-781

CHEMISTRY, ANALYTICAL

THE USE OF CHROMOUS CHLORIDE IN ORGANIC FUNCTIONAL GROUP ANALYSIS

(Publication No. 20, 107)

Rudolph S. Bottei, Ph.D. Princeton University, 1955

A standard chromous chloride solution was used for the determination of a number of reducible organic compounds. The reagent was prepared determinately from potassium dichromate according to the method of Lingane and Pecsok, which involves the complete reduction of chromic ion by amalgamated zinc. Solutions of the compounds were analyzed by either titrating directly or by adding an excess of chromous chloride and back titrating with either standard ferric alum or ferricyanide solution. The reductions were usually performed at room temperature; however, 2,4,6 trinitrobenzoic acid had to be heated to effect a quantitative reduction of all three nitro groups. The end points were determined potentiometrically. Except where otherwise specified, the indirect procedure was used in the determination of the following compounds.

Ortho-nitrobenzoic acid, 2,4,6 trinitrobenzoic acid, 2,4,6 trinitroresorcinol, and 2,4 dinitrophenylhydrazine in hydrochloric acid medium and nitroguanidine in neutral medium were used to the corresponding amino compounds. In acid or citrate-buffered medium, the amount of reduction of nitroguanidine was variable and considerably less than the theoretical six equivalents per mole.

Nitroso "R" salt, p-nitrosodimethylaniline, N-nitroso-diphenylamine and N-nitroso-N-phenylbenzylamine were reduced in acid medium to the corresponding amines, that is, four equivalents of chromous chloride were required per mole. With cupferron, six equivalents were used per mole which was indicative of a reductive cleavage at the N-N bond. Special procedures were used in the analysis of N-nitrosodiphenylamine, N-nitroso-N-phenylbenzylamine, and cupferron because of their instability in acid solution.

Para-nitrobenzeneazoresorcinol, calcocid orange Y and tartrazine yellow were reduced in acid medium to the corresponding amines by cleavage of the N-N bond. A study of the reduction of azobenzene at room temperature indicated that there were two equivalents per mole. At elevated temperatures, there was a slight increase in the amount of reduction. It seems probable that a quantitative reductive cleavage of azobenzene may be effected by prolonged heating.

Hydroazobenzene in either acid or neutral medium was not reduced by chromous chloride. At elevated temperatures there may have been a slight reduction. In the back titration of chromous with ferric alum, a white precipitate would form shortly before the end point.

493

Azoxybenzene was satisfactorily determined by first allowing it to rearrange in 1:1 sulfuric acid and then titrating the resulting azo compound.

Para-diethylaminobenzenediazonium chloride, p-ethylhydroxyethylbenzenediazonium chloride, and p-ethylbenzylaminobenzenediazonium chloride were reduced in neutral or slightly acid solution to the corresponding hydrazine compounds.

Diacetyl and benzil were reduced in hydrochloric acid medium to acetoin and benzoin, respectively. Benzil may be determined by either the direct or indirect procedure, while diacetyl may be determined only by the indirect method of analysis. The results for diacetyl were consistently 3 to 4 percent low.

Anthraquinone 2.7 disodium sulfonate was reduced in hydrochloric acid medium to the corresponding anthrahydroquinone by titrating directly with chromous chloride. Its determination by the indirect procedure invariably gave low results because of the oxidation of anthrahydroquinone by either ferric alum or ferricyanide. Anthraquinone 1-nitro-5-sodium sulfonate was reduced to the corresponding aminoanthrahydroquinone. It may be determined by either method of analysis.

In neutral medium the monopotassium salt of acetylene-dicarboxylic acid was quantitatively reduced to the corresponding ethylenic compound, while the reduction of propiolic acid to propenoic acid was incomplete and varied from 97.1 to 98.8%. Diphenylacetylene, 2-methyl-3-hexyne-2,5-diol, 2,5-diphenyl-3-hexyne-2,5-diol, 2-methyl-3-butyn-2-ol, and 1-ethynyl-cyclohexanol-1 were not reduced even at elevated temperatures. The non-reducibility of the latter four compounds may be attributed to the lack of conjugation in the molecules. Although there is conjugation in the diphenylacetylene molecule, it is rather difficult to reduce as indicated by the very negative polarographic reduction potential of -2.20 volts vs. S.C.E.

111 pages. \$2.00. Mic 57-782

CHEMISTRY, BIOLOGICAL

STUDIES ON THE EFFECT AND MODE OF ACTION OF GENISTIN ON THE GROWTH OF ANIMALS

(Publication No. 20,177)

Melvin Winsor Carter, Ph.D. North Carolina State College, 1956

Supervisor: Gennard Matrone

The purpose of this investigation, conducted in two phases, was to gain information concerning the mode of action by which genistin, a plant isoflavone possessing estrogenic activity, affects growth.

In Phase I of this study comparisons were made of the effect on growth of genistin and its aglucone genistein, with that of stilbestrol and estradiol, in an effort to determine whether or not genistin and genistein depressed growth in a manner similar to estrogens. The results obtained were as follows: (1) The growth curves (based on body weight) obtained from mice given various levels of

these compounds orally demonstrated that ten-fold increments of estradiol and stilbestrol were necessary to obtain the same retardation in growth that resulted from two-fold increments of genistin and genistein. (2) The growth curves obtained from each compound were essentially linear when the response (body weight) was plotted against the logarithmic dose. (3) Estradiol had a greater depressing effect on gonad weight than genistein and affected the kidney weight of male and female mice in a different manner than genistein. (4) Genistin, estradiol and stilbestrol given chicks did not significantly affect growth at the levels given. The information obtained from this phase indicates that the growth retardation resulting from feeding of genistin is brought about in a manner different from that of estrogens.

The studies of Phase II were conducted to survey the possibilities of an alternate hypothesis that genistin may possess physiological properties similar to phlorizin (a compound of similar structure to genistin, also possessing weakly estrogenic properties) thereby affecting growth either by causing glucosuria and/or by inhibiting the intermediary metabolism of carbohydrates. Genistin given orally caused a rise in the reducing substance of the urine of both mice and rabbits but it was found that this rise was due to some substance other than glucose. Both genistin and phlorizin were found to inhibit the anaerobic breakdown of hexose diphosphate by yeast extract to approximately the same degree. From the results obtained it appears that the growth retardation caused by genistin is probably not due to glucosuria. Genistin may depress growth, however, by inhibiting or blocking metabolic reactions. 105 pages. \$2.00. Mic 57-783

INTERRELATIONSHIPS OF DIET AND CERTAIN METABOLIC COMPONENTS, WITH PARTICULAR REFERENCE TO NIACIN AND TRYPTOPHAN

(Publication No. 18,387)

Marilyn Marie Chaloupka, Ph.D. The University of Wisconsin, 1956

Supervisors: Professor May S. Reynolds and Associate Professor J. N. Williams, Jr.

An equal number of male and female young adult albino rats were severely depleted of niacin and tryptophan by feeding a niacin-tryptophan deficient ration for one to two months. Blood pyridine nucleotide levels were determined at the end of the depletion period. The effect of supplementing the basal ration with graded levels of tryptophan, but no niacin, on nitrogen balance, growth, and changes in blood pyridine nucleotide levels was studied. In one experiment depleted rats were used as their own controls and were fed gradually increasing levels of 0, 0.02, 0.08, 0.14, 0.20, and 0.30 per cent of L-tryptophan in the basal ration, after receiving each level for a certain time interval. Nitrogen balance, growth, and blood pyridine nucleotide levels were determined throughout the experimental period. In another experiment the depleted rats were separated into five groups and each group received a different, constant level of L-tryptophan in the ration (from 0 to 0.20 per cent). Nitrogen balance, growth, and changes in blood pyridine nucleotides were measured throughout the 30 day experimental period. Blood pyridine nucleotide values were calculated and expressed as uM of pyridine nucleotide per ml of blood multiplied by the estimated body surface area, giving a value which should be proportional to the "total circulating" blood pyridine nucleotides, as a relatively constant relationship has been shown to exist between surface area and total blood volume. In both experiments the niacin-tryptophan depleted rats demonstrated a pattern or sequence of responses to increasing levels of tryptophan supplementation. This sequence, identical in both experiments, was: 1. maintenance of nitrogen equilibrium on the low levels, 2. increase in body weight on the intermediate levels, and 3. a measurable increase in "total circulating" pyridine nucleotides on the higher levels of tryptophan supplementation. This has been interpreted as an indication of the preferential use of limiting amounts of tryptophan for the biochemical functions for which the demand is the greatest after a prolonged period of depletion.

Similarly depleted young adult rats were separated into three groups and fed supplements to the basal ration of 0.20 per cent L-tryptophan, 2 mg per cent niacin, and 0.20 per cent tryptophan plus 2 mg per cent niacin, respectively, for two weeks. In another experiment four groups of depleted rats were given the three levels of supplementation mentioned above or no supplement for 30 days. Weight changes and blood pyridine nucleotide levels were determined. In both experiments the rats receiving tryptophan or niacin plus tryptophan grew equally well, but the ones receiving only niacin continued to lose weight slowly, as did the unsupplemented animals in the later experiment. At the end of 30 days the "total circulating" pyridine nucleotide levels had increased to the same extent in the animals receiving tryptophan and niacin plus tryptophan, although niacin plus tryptophan had appeared to be slightly superior to tryptophan alone after only two weeks of supplementation. Niacin supplementation maintained the "total circulating" pyridine nucleotides at a constant, but low, level for 30 days, indicating limited synthesis of pyridine nucleotides, as compared with the unsupplemented group, in which the "total circulating" pyridine nucleotide levels continued to decrease.

74 pages. \$2.00. Mic 57-784

THE MECHANISM OF PERIODATE OXIDATION OF SIMPLE SUGARS

(Publication No. 20,206)

John Christensen, Ph.D. Michigan State University, 1956

The oxidation of D-glucose by periodate has been investigated with respect to mechanism. A spectrophotometric method of following the change of concentration of periodate by measuring the optical density at 222.5 millimicrons has been developed. The mechanism of the periodate attack on D-glucose has been found to consist of a small amount of random attack on acyclic glucose accompanied by oxidation of the cyclic form to give 2-formyl glyceraldehyde ester. This ester then slowly hydrolyzes as the rate-determining step in the reaction, followed by

further oxidation of the glyceraldehyde. A similar reaction has been found to take place with D-Arabinose.

The reaction of 1,3-diketones with periodate has been investigated and four 1,3-diketones have been found to react (acetyl acetone, 1,1-dimethylcyclohexan-1,3-dione, 3-methyl-2,4-pentadione and 1,4-diphenyl-1,3-butadione). These involve both cyclic and acyclic compounds. The reaction has been found to produce no formic acid or formaldehyde, but it does produce carbon dioxide from unsubstituted 1,3-diketones. The reaction is more rapid with periodic acid than with sodium periodate. A mechanism for the reaction has been proposed. The stoichiometric ratio of periodate to unsubstituted 1,3-diketones has been found to be about four to one.

The reaction of periodate with D, L-glyceraldehyde has been investigated. In reactions involving excess glyceraldehyde and in which final production of formic acid and formaldehyde are determined analytically, a method of calculating glycolaldehyde and glyoxal production as well as glyceraldehyde consumption has been devised. The method has been applied to the task of finding the relative rates of attack on the carbonyl-carbinol bond (C_1-C_2) and the glycol bond (C_2-C_3) in glyceraldehyde. The rate of the first has been found to exceed that of the latter by at least a factor of five.

A decrease in concentration of the glyceraldehydeperiodic acid reaction mixture produces an increase in rate of the reaction, particularly at the initial stage. A decrease in pH below that produced by the periodic produces a decrease in rate during the first stage. Addition of equivalent amounts of sodium hydroxide produces a decrease in the final stage of the reaction.

The depolymerization of the dimer of \underline{D} , \underline{L} -glyceraldehyde has been investigated at 0° C and the equilibrium constant has been found to be 1.0.

113 pages. \$2.00. Mic 57-785

CHEMICAL, PHYSICAL, AND BIOLOGICAL STUDIES OF RATS' MILK AND ITS COMPONENTS

(Publication No. 18,928)

Robert Louis Glass, Ph.D. University of Minnesota, 1956

Rats' milk was obtained by the manual stripping of the teats of lactating females anesthetized with Nembutal. A variety of tests were applied to ascertain that milk which had been permitted to accumulate in the mammary glands for periods of from 2 to 24 hours had essentially the same properties as milk obtained by the suckling young who nurse at intervals of 3 hours or less. These tests included electrophoretic analyses of whole milk proteins, chemical analyses of the gross composition, and nitrogen distribution in milk collected at various times postweaning.

Rats' milk contains approximately 21% solids which are distributed as 44.1% fat, 39.3% protein, 11.1% carbohydrate, and 5.5% ash. Colostrum differs from later milk mainly in containing twice as much fat; the other constituents are present in amounts similar to milk. The distribution of nitrogen in what was arbitrarily defined as the casein fraction, the non-casein protein fraction, and the

non-protein fraction is similar to that in the milk of the cow. Casein contributes 69.4%, non-casein protein 22.4%, and non-protein nitrogen 8.2% of the total nitrogen. In rats' colostrum casein contributes 47% of the total nitrogen.

Electrophoretic analyses revealed that the proteins of rats' colostrum are markedly different from those of later milk. The transition from colostrum to milk appeared to be complete by the second day post-partum. No change in the electrophoretic pattern of the blood serum of the young was observed as a result of the ingestion of colostrum. The pattern obtained from the blood serum of newborn rats was very similar to that obtained from 2 day old rats. After this time there was an increase in the complexity of the blood serum proteins which, however, was not complete at 21 days of age. The pattern obtained from blood serum of adult rats was different from 21 day old rats.

The principal protein of rats' milk, a phosphoprotein, is markedly different from casein of bovine origin. Electrophoretic analyses of caseins from the milks of the rat, cow, goat, rabbit, and human showed that all were heterogeneous and different from one another. Rat casein migrated as 2 peaks with mobilities of -6.8 x 10^{-5} and -5.5 x 10^{-5} cm²/volt/second in veronal buffer pH 8.6, u = 0.1. Its isoelectric point, as determined by solubility is pH 3.9 \pm 0.1. Paper chromatography of acid hydrolyzates, as well as chemical analyses, showed that the amino acid content is qualitatively the same as that of cow casein, but some quantitative differences have been observed.

Serological studies using the quantitative precipitin technique failed to reveal any similarity between rat casein and casein from the milk of the cow, rabbit, goat, or human. Cow casein is very similar to goat casein but distinct from casein of the rat, rabbit, or human.

The proteins in rats' milk are not precipitated by 12% trichloroacetic acid, 20 volumes of saturated picric acid, or 1 volume of 10% metaphosphoric acid. This appears to be the result of a protective effect of the casein as it exists in native rats' milk.

Lactose was identified as the principal carbohydrate of rats' milk by the isolation of the crystalline material, by study of its physical properties, and by preparation of 3 crystalline derivatives, octaacetyl- β -lactose, lactosazone, and N-p-nitrophenyl lactosylamine. The presence of reducing sugars other than lactose in the milk was established by paper chromatography. In addition rats' milk contains a compound, or compounds, which when boiled in the presence of 1 N HCl yields a dark purple color. This material is not a protein but it has not been further identified. 116 pages. \$2.00. Mic 57-786

THE FRACTIONATION AND CHARACTERIZATION OF CORN ENDOSPERM PROTEINS

(Publication No. 19,420)

Norman Edward Lloyd, Ph.D. Purdue University, 1956

Major Professor: Edwin T. Mertz

Ground, defatted corn endosperm was extracted with hydrochloric acid solutions containing sodium sulfite in

order to test this combination of reagents as a corn protein extractant. Sixteen per cent of the nitrogenous components of the endosperm could be solubilized after 40 hours of extraction with this reagent at pH 2.0. Investigation of one of the extracts by electrophoresis revealed that two major and two minor components were present. One of the major components possessed the solubility properties of an albumin, and had an isoelectric point at pH 7.75. The other major component was shown to consist of starch. The two minor components could be identified electrophoretically with the zein or glutelin fraction of the endosperm proteins.

Experiments on the variation of conditions for the extraction of ground endosperm with an alkaline reagent containing copper sulfate and sodium sulfite (3) showed that the pH of the extraction reagent materially affected the extent to which the nitrogenous components of the corn were solubilized. Appreciable amounts of the nitrogenous components were not removed from the endosperm unless the pH of the extractant was 11.5 or higher. Grinding of the endosperm in a colloid mill before extraction, to further reduce the particle size below that ordinarily attained, resulted in marked acceleration of the rate at which the nitrogenous components could be extracted. The addition of sodium salicylate to the extraction medium resulted in a small, but noticeable, improvement in the extent of extraction. Partial evaluation of the effects of the alkaline copper reagent on corn proteins revealed that no ammonia is released from the proteins when treated with the reagent, that lanthionine is not produced (less than 1 part of lanthionine in 500 parts of protein) by the action of the alkaline reagent on the cystine residues of the proteins, and that the optical rotation of zein, the major fraction of corn proteins, is not altered by the reagent.

The method of corn protein extraction with the alkaline reagent containing copper sulfate and sodium sulfite was used as the starting point in the development of a facile method for the separation of corn endosperm proteins into four fractions; insoluble, acid soluble, zein, and glutelin. Extracts of the proteins of the germ were also made with the alkaline copper-containing reagent. Investigation of the extracts and fractions by electrophoresis revealed that they were all mixtures. The germ fraction was the most complex and the glutelin fraction the simplest. Assuming that the proteins of the germ and endosperm differ from one another in one or more properties, a total of eleven different components could be counted. The acid soluble fraction of the endosperm proteins contained about onethird dialyzable, nonprotein nitrogen, and the components which were not dialyzable could be identified electrophoretically with the principle components of the zein and glutelin fractions.

The glutelin fraction of the endosperm proteins was studied further. Electrophoresis of the fraction, prepared by isoelectric precipitation from solutions of corn endosperm proteins dissolved in cold, alkaline, aqueous alcohol, revealed a single component. However, analytical ultracentrifugation showed that three components were present which were called the alpha, beta, and gamma components in the order of decreasing rate of sedimentation. The beta and gamma components possessed sedimentation coefficients $(S_{W,20})$ of 8.0 and 1.6 Svedberg units respectively. No sedimentation coefficient for the alpha component was calculated since it was made up of material of widely varying molecular weight.

The gamma component, representing approximately 25 per cent of the glutelin fraction, was isolated by high speed centrifugation and was characterized by electrophoresis, ultracentrifugation and diffusion. The molecular weight of the component, calculated from sedimentation and diffusion, was 21,000 to 26,000. The axial ratio of the molecule was 19-22.

496

The nitrogen contents of glutelin, and of the gamma glutelin component were 16.1 and 16.2 per cent respectively. Both protein preparations contained carbohydrate. The amino acid contents of glutelin and of the gamma glutelin component were determined by chromatography of the acid hydrolysates on columns of Dowex 50 except for proline and tryptophan which were determined by alternate methods of analysis. Both of these protein preparations contained similar quantities of all of the common amino acids except for alanine and leucine which were higher in glutelin than in gamma glutelin. Neither of the protein preparations could be considered adequate from the nutritional standpoint since they were deficient in the essential amino acids isoleucine, lysine, and tryptophan when compared to whole egg protein which has sufficient amounts of these amino acids. When compared to zein, however, both proteins were better balanced in their contents of the essential amino acids.

102 pages. \$2.00. Mic 57-787

THE EFFECTS OF ROENTGEN RAYS ON SEVERAL BIOLOGICAL SYSTEMS WITH SPECIAL REFERENCE TO THEIR MODIFICATION BY HEMATOPORPHYRIN

(Publication No. 18,941)

Merle Kenneth Loken, Ph.D. University of Minnesota, 1956

An investigation was conducted on the effects of roentgen rays on several biological systems with special attention being focused on the modification of these effects by chemical means. Impetus for this work was derived from experiments showing more regression in the size of transplanted mammary carcinoma in ZBC mice when treated with hematoporphyrin followed by roentgen irradiation of the tumors, than mice bearing identical tumors treated with radiation alone. Although hematoporphyrin was the compound of principal interest, other porphyrins as well as sulfhydryl compounds, sodium cyanide, folic acid analogus and fluorescent dyes have been utilized.

Search was made for a material which would enhance the therapeutic effectiveness of x-rays on tumors by its presence in viable and actively growing tumor cells. It was thought that the porphyrins and analogues might potentiate the effects of radiation on tumor tissue, while certain protective agents as sulfhydryl compounds and cyanide might exert influence through preferential protection of normal tissues. From the information gained it is apparent that none of the compounds are efficacious as modifiers. However, the analogues are considered to be of potential value because of the improved tumor response and survival in mice treated with combined analogue and x-ray therapy.

Several systems were employed to make possible more rapid scanning of the role of modifiers and to aid in the

evaluation of the mechanisms involved. The studies have included: hemolysis of erythrocytes, inactivation of proteases, regression of tumors in mice and survival of bacteria, paramecia, and mice.

Hematoporphyrin produced no modifying effect of x-rays on erythrocytes and bacteria. With the other systems the results have indicated that the effects depend upon the dose of the compound administered, the time between its administration and the subsequent irradiation, and the dose of radiation used. In general it may be said that large doses of porphyrins approaching toxic levels afford protection. Potentiation of the radiation effect is oftentimes found with lower doses.

The effects found in in vivo systems can be expected to be most directly applicable to the problem of cancer therapy. However, because of the complexity of whole organisms, radiation effects on proteases in vitro were also investigated. This included study of such factors as pH, concentration of various ions, temperature, enzyme concentration, antiproteolytic activity of the albumin substrate, delayed inactivation following radiation, importance of various radicals formed in water by x-rays on enzyme inactivation, as well as the effects of chemical modifiers.

Although it has been reported that pepsin and trypsin exhibit an inactivation following irradiation which is temperature dependent and may be several times greater than the immediate inactivation, no evidence of this effect was found. The results indicate that this discrepancy is attributable to differences in assay methods. Other data indicate that hydroxyl radicals are of greatest importance in the inactivation of the proteases. Hematoporphyrin as well as glucose, sucrose and sulfhydryl compounds compete with the protease molecules for this radical and thus provide protection. Higher concentrations of porphyrins were found to produce complete inactivation of these enzymes.

This investigation has shown that hematoporphyrin in its present state of purity is not as efficient a modifier as are the sulfhydryl compounds, folic acid analogues or cyanide. Possible exceptions to this are the potentiation of lethality observed using paramecia, and the modification of mortality of mice receiving total body irradiation. It is quite possible that a particular porphyrin or combination of porphyrins will be found making possible the reproduction of the initial investigation of tumor response in mice receiving combined porphyrin and x-ray therapy. An intense search for such a material is still underway.

219 pages. \$2.85. Mic 57-788

STUDIES ON THE RELATIONSHIP OF HYDROGEN PEROXIDE TO RESPIRATION IN CLOSTRIDIUM PERFRINGENS

(Publication No. 20,417)

Morton Lewis Mallin, Ph.D. Cornell University, 1956

As a result of unsuccessful attempts to demonstrate H_2O_2 accumulation attending or following glucose respiration by intact cells of Clostridium perfringens, strain BP6K, several possible mechanisms for H_2O_2 disposal were experimentally examined. Among them, a DPNH

peroxidase and a reaction between a keto acid and H_2O_2 appeared as two distinct routes of disposal which could explain the failure to detect H_2O_2 in respiring cells of anaerobes.

The study was restricted to Clostridium perfringens, strain BP6K. In whole cells H_2O_2 was never detected as a result of respiration. The same was true of fresh cell-free extracts. These findings contrasted to the direct demonstration of H_2O_2 produced in aged extracts oxidizing DPNH or HDP.

The aging of the extracts relating to the appearance of H_2O_2 during respiration was correlated with the fortuituous decline of DPNH peroxidase activity attending aging, or freezing and thawing.

In addition to the H_2O_2 disposing system (the DPNH peroxidase) in fresh extracts, both fresh and aged extracts exhibited DPNH oxidase activity which could account for H_2O_2 production in extracts, dried cells, or whole cells.

The presence in extracts of DPNH oxidase and peroxidase systems suggests possible sites for oxygen uptake, H_2O_2 production, and H_2O_2 disposal in the organism.

On the basis of heat labilities both the DPNH oxidase and the DPNH peroxidase activities appeared to be enzymatic. No attempt was made to characterize the systems with respect to prosthetic groupings or conditions for optimum functioning.

The fact that aged extracts accumulated only small amounts of H_2O_2 appears to be due to the incomplete inactivation of the DPNH peroxidase effected by the aging.

The second and perhaps more minor route for H_2O_2 disposal appeared to be related to at least one keto acid which was found to accumulate in a mixture of keto acids. These keto compounds were formed by cells degrading glucose under aerobic conditions. The supernatant obtained from cells, glucose, and buffer (which comprise the respiration system giving rise to the products of glucose degradation) is referred to as the respiration mixture. The possible relationship of the keto compound to H_2O_2 was based on the well established oxidative decarboxylation of pyruvate by H_2O_2 , which reaction yields acetate, CO_2 and H_2O_2 . The following results were obtained and used as a basis for implicating pyruvate as an agent in H_2O_2 disposal:

1. Paper chromatograms of the 2,4-dinitrophenylhydrazine derivatives from the cell-free respiration mixture yielded spots whose locations agreed with those of known pyruvate. In addition, an unknown spot appeared.

- 2. The respiration mixture, freed of cells, even after heating at 80C for 2 minutes, was able to dispose of 40 to 50 ug of added H₂O₂; when incubated with an agent known to bind carbonyl compounds (semicarbazide) the disposal ability was almost completely removed.
- 3. The respiration mixture contained a level of keto compound(s) (measured as pyruvate) which, on a molar basis, was approximately twice that of the H_2O_2 removed.
- 4. Upon the addition of an excess of H_2O_2 (about 10 uM) to the cell-free respiration mixture, a level of $\overline{CO_2}$ was evolved which was, on a molar basis, about $\frac{1}{2}$ the level of keto compound normally detected in the mixture.

From these results it was concluded that more than

one keto acid was formed from glucose break-down, and that at least one was an agent involved in H_2O_2 disposal. 102 pages. \$2.00. Mic 57-789

STUDIES WITH FLUOROACETATE, FLUOROACETYL COENZYME A AND FLUOROACETYL PHOSPHATE

(Publication No. 18,753)

Abraham Marcus, Ph.D. The University of Buffalo, 1956

Previous work has established the in vivo condensation of fluoroacetate with oxaloacetate to form fluorocitrate, which compound prevents further metabolism of citrate by aconitase. The present study was designed to clarify the detailed enzymatic reactions leading to fluorocitrate synthesis. By analogy with the reactions of acetate, it seemed probable that fluoroacetate reacted in two stages; (1) activation to fluoroacetyl coenzyme A, (2) transfer of the fluoroacetyl group to the appropriate acceptor.

The first experiments involved a study of the enzymatic activation of fluoroacetate with hydroxylamine as a trapping agent for the activated compound. With high substrate and co-factor concentrations (relative to that required for acetate) definite activation of fluoroacetate was demonstrated. Maximum activation of fluoroacetate was only 10-15% that of acetate.

The next experiments involved a study of the ability of fluoroacetyl coenzyme A to participate in CoA mediated reactions. These reactions fall into two categories; (a) those involving condensation of the carboxyl group of acetate, (b) those involving condensation of the methyl group. As examples of these two types of reactions, p-nitroaniline acylation and citrate formation were chosen respectively. Fluoroacetyl coenzyme A was prepared by reaction of fluoroacetic anhydride with coenzyme A and its reactivity compared in the above reactions with synthetic acetyl coenzyme A. The enzymes for both reactions were partially purified according to established procedures. In contrast to the aforementioned activation experiments, fluoroacetyl coenzyme A in both reactions was closely comparable in activity with acetyl coenzyme A.

During the course of the above experiments it was noted that fluoroacetyl coenzyme A was much less stable than acetyl coenzyme A. In addition, a detailed study of its enzymatic reactions was prohibited by the cost of pure coenzyme A. It appeared possible to solve both problems by the preparation of a fluoroacetyl compound that might be enzymatically linked to the coenzyme A - mediated reactions. Such a compound would also allow a careful study of the properties introduced by the α -F atom. The compound chosen was fluoroacetyl phosphate.

The literature on the synthesis of acyl phosphates indicated several methods that appeared to be applicable to the preparation of fluoroacetyl phosphate. Condensation of fluoroacetic anhydride with potassium phosphate was tried, but acyl phosphate was not obtained. Employment of a mixed anhydride of ethyl chlorocarbonate and fluoroacetic acid yielded small amounts of fluoroacetyl phosphate of very low purity. Acetyl phosphate was conveniently prepared by both methods. Finally, it was found that fluoroacetyl phosphate could be prepared by condensation of

fluoroacetyl chloride with silver phosphate. A product of about 60% purity with inorganic phosphate as the major contaminant, was obtained.

The effect of pH on the hydrolysis indicated that fluoroacetyl phosphate was highly unstable at neutral pH with maximum stability at about pH 2. In contrast, acetyl phosphate had maximum stability at neutral pH. Mg++, Ca+ and pyridine accelerated the hydrolysis of both acyl phosphates at neutral pH, but the pyridine catalysis was greater with fluoroacetyl phosphate. At acid pH, Mg++, and Ca++ accelerated the hydrolysis of fluoroacetyl phosphate whereas acetyl phosphate hydrolysis was unaffected. In enzymatic experiments, fluoroacetyl phosphate was found to be much the more susceptible to both mammalian (pig heart extract) and bacterial (E. coli) acyl phosphatase. Participation of fluoroacetyl phosphate in the coenzyme A - requiring transacetylase system was demonstrated by the function of fluoroacetyl phosphate in the arsenolysis reaction with an alcohol fraction of E. coli extract. By coupling the E. coli transacetylase with appropriate acceptor systems, comparisons were made of the rates of reaction of the acetyl and fluoroacetyl compounds in various additional enzymatic reactions.

Implications of the findings and possible explanatory mechanisms are discussed.124 pages. \$2.00. Mic 57-790

CHEMICAL STUDIES ON A TOXIC FACTOR FROM LATHYRUS ODORATUS SEEDS

(Publication No. 18,441)

Eugene Dudleigh Schilling, Ph.D. The University of Wisconsin, 1956

Supervisor: Professor F. M. Strong

Toxic effects resutling from consumption of legumes of the genus Lathyrus have long been observed in man and domestic animals. Symptoms produced by certain Lathyrus peas are mainly neurological in character and have been called "lathyrism." Other Lathyrus species produce an extreme abnormality of the skeleton, including kyphosis, scoliosis, increased shaft diameter, exostoses of the long bones, rib cage deformity and generalized osteoporosis. In addition, many of the animals develop hernias and aortic ruptures. This condition has been called "odoratism."

The isolation from Lathyrus odoratus seeds of a crystalline substance capable of producing skeletal abnormalities characteristic of odoratism has been accomplished. Concentrates were obtained by extraction of L. odoratus meal with 30% ethanol and deproteinizing with lead acetate. Additional purification steps used included distribution between 95% ethanol and saturated aqueous potassium carbonate, drying the ethanol-soluble fraction on paper pulp, removal of impurities by butanol extraction, and extraction of the active substance with methanol. The compound (I) crystallized in the form of fine white needles, m.p. 193-194° dec. and gave analytical values agreeing with the formula C₈H₁₃O₃N₃.

The compound showed only one ninhydrin positive spot when subjected to paper chromatography in three different solvent systems. After strong acid hydrolysis this spot disappeared and was replaced by two others. Concentration of the hydrolysis mixture yielded L-glutamic acid hydrochloride. When the filtrate was made alkaline and distilled, a volatile base was evolved which was identified as ammonia by conversion to ammonium chloride and demonstrating the absence of carbon. This result together with a sharp band at 4.45 μ in the infrared spectrum pointed to the presence of a nitrile function in I. The remaining degradation fragment was identified as β -alanine by comparative paper chromatograms and the isolation of the β -naphthalene sulfonate derivative. It was concluded that I is β -(N- γ -L-glutamyl)-aminopropionitrile. The γ -glutamyl structure was favored because I showed pK values of 2.2 and 9.1.

Accordingly a substance of this structure was synthesized by condensation of β -aminopropionitrile with phthaloyl-L-glutamic acid anhydride and subsequent removal of the phthaloyl substituent with hydrazine. The synthetic L-compound was identical with isolated I.

Both the synthetic L- and DL-compounds were fully active in producing odoratism in rats. It thus appeared that the glutamic acid portion of I might not be necessary for activity, and it was readily established that the toxicity was due to the β -aminopropionitrile (BAPN) portion of the molecule. When BAPN was fed to rats at 0.1-0.2% of the diet it produced all the symptoms of odoratism.

The only structural analogs of BAPN that showed activity were aminoacetonitrile and β -mercaptoethylamine. Slight skeletal deformities were elicited by bis-(β -cyanoethyl)-amine, but the main effect of this compound was the production of nervous symptoms. Methylation or acetylation of the amino group rendered the BAPN biologically inactive. Ethylene cyanohydrin, trimethylene diamine, and β -nitroethanol, somewhat related compounds, did not produce odoratism.

By supplementing BAPN-containing diets with various amino acids and B vitamins, it was not possible to prevent malformation of bone in rats.

It became of interest to learn something of the mechanism of action of BAPN. The synthesis of N¹⁵ labeled BAPN has been accomplished, with the label in the amino group. Preliminary animal assays indicated that intact BAPN is not incorporated into mesenchymal tissues.

The synthesis of C¹⁴ labeled BAPN has been accomplished, with the compound labeled in the nitrile group. The BAPN was prepared by reaction of ethylene chlorohydrin with potassium cyanide to give ethylene cyanohydrin, followed by dehydration to acrylonitrile and subsequent condensation with ammonia. Animal testing of this compound is currently in progress.

60 pages. \$2.00. Mic 57-791

END GROUP STUDIES OF POLYVALYL-PROTEINS

(Publication No. 20,062)

Alfred Stracher, Ph.D. Columbia University, 1956

The reaction of N-carboxyvaline anhydride with several proteins has been studied. It has been shown that both the esterolytic and proteolytic activities of poly-DL-valyl-chymotrypsin was decreased by 57 per cent compared to the unmodified protein.

End group analysis by Sanger's method on DNP-poly-DL-valyl-chymotrypsin and DNP-poly-DL-valyl-lysozyme has shown that all of the free amino groups that had been acylated could be accounted for as DNP-valine. These results have shown that the reaction of N-carboxyamino acid anhydrides with proteins was essentially specific for free amino groups.

DNP-peptides have also been isolated from these modified proteins under conditions usually employed for total hydrolysis. These peptides have been shown to contain as many as nine amino acids from the protein chain, in addition to the added valine. The presence of lysine in these peptides also has given strong evidence that the attachment of the poly-DL-valyl-peptides to the proteins takes place through the formation of a peptide bond with the ϵ -amino groups of the protein. No peptides have been isolated from the N-terminal ends.

DNP-peptides have also been isolated from hydrolysates of DNP-poly-L-valyl-chymotrypsin in which lysine was not one of the amino acids. These peptides must therefore be from the N-terminal ends of the protein and constitutes the first isolation of such a peptide. These results were conclusive in showing that α -amino groups are acylated as well as the ϵ -amino groups. Possible explanations for the differences observed between poly-Lvalyl-chymotrypsin and poly-DL-valyl-chymotrypsin have

A DNP-phosphopeptide has been obtained from DNPdiisopropylphosphoryl-poly-DL-valyl-chymotrypsin. The possible implication of this peptide as part of the active site of the enzyme has been discussed.

An end group analysis of totally hydrolyzed DNP-poly-DL-valyl-insulin showed that 100 per cent of the amino groups which had been acylated could be accounted for as DNP-valine. A 16 hour hydrolysis of the same compound yielded a peptide containing lysine and 10 other amino acids (in addition to valine). This peptide could only be coming from the C-terminal end of the "B" chain. No peptides from the N-terminal ends were found. In addition, the peptide was isolated in 95 per cent yield, indicating its extreme stability.

DNP-poly-L-valyl-"A" chain and DNP-poly-DLvalyl-"B" chain both yielded DNP-peptides under similar conditions used for other proteins. The latter yielded a DNP-peptide containing lysine from the chain. The possibility that the "A" and "B" chains in the intact insulin molecule help stabilize each other has been discussed.

121 pages. \$2.00. Mic 57-792

CHEMISTRY, INORGANIC

STUDIES ON THE OXIDATIVE AND THERMAL STABILITY OF COMPLEX INORGANIC COMPOUNDS (PARTS I-III)

(Publication No. 19,815)

William Charles Drinkard, Jr., Ph.D. University of Illinois, 1956

I. Coordination Polymers.

Coordination polymers of copper phthalocyanine have been shown to form when pyromellitic dianhydride is

substituted for phthalic anhydride in the copper phthalocyanine synthesis. Elemental analysis and end-group titration indicated molecular weights ranging from 1,500 to greater than 20,000. The degree of polymerization depended upon temperature of reaction, ratio of reacting components and time of reaction. Cobalt and nickel ions also formed phthalocyanine polymers.

Polymerization of bis(N-hydroxyethyldiethylenetriamine) cobalt(III) chloride by reaction of the free hydroxyl groups was not successful due to the extreme inertness of

the hydroxyl groups.

II. Ferrous Ion Oxidation

Attempts to oxidize nickel(II) to the plus three state in a series of square planar complexes by bromine vapor were unsuccessful. Bromination of the ligand occurred in most cases.

Polarographic studies on the effect of electronegativity of coordinated atoms on the shift in half-wave potential of nickel(II) were unsuccessful due to adsorption of the ligand to the surface of the electrode.

85 pages. \$2.00. Mic 57-793

SULFAMIDE AND SOME OF ITS DEAMMONATION PRODUCTS

(Publication No. 19,872)

Milton K. Snyder, Ph.D. University of Illinois, 1956

A literature survey indicated that much confusion existed about the preparation and deammonation of sulfamide. Although many methods of synthesis had been tried for sulfamide, few were successful. Recent investigations of trisulfimide and tetrasulfimide helped to clarify the picture of the cyclic deammonation products of sulfamide. However, the studies of the linear condensation polymers of sulfamide have been limited to imidodisulfamide.

The method prescribed by Kirsanov and co-workers for the ammonolysis of sulfuryl chloride in carbon tetrachloride was found best for the synthesis of sulfamide (7). Yields were slightly lower in the gas phase ammonolysis of sulfuryl chloride, as described by Sisler and Rosenbaum (8). The ammonolysis of sulfuryl chloride in petroleum ether was considerably less successful than originally indicated by Andreson (1, 2). Low yields of very pure sulfamide were prepared by the method of Traube and Reubke (9), viz., the ammonolysis of sulfuryl fluoride.

The following reactions proved unsatisfactory for the preparation of sulfamide: the reactions of sulfuryl chloride with ammonium chloride, urea, lithium amide, and Divers' solution; the reaction between sulfuryl chlorofluoride and ammonia; the ammonolysis of organic chlorosulfonates; the amidation of sulfamic acid with either urea or formamide. The reactions of sulfamic acid with thionyl chloride and oxalyl chloride failed to produce sulfamyl chloride, which had been proposed as an intermediate in the synthesis of sulfamide. An investigation of reports that sulfamide was obtained in excellent yields by the ammonolysis of phthalimido sulfonyl chloride (3, 4) proved this method to be impractical. Treatment of silver thiocyanate with sulfuryl chloride produced the previously

reported polymeric sulfuryl thiocyanate (5). Similarly, silver cyanide presumably produced polymeric sulfuryl cyanide. Neither of these two substances could be ammonolyzed.

Aqueous, basic condensations, as suggested by Kirsanov and Zolotov (6), led successively to the linear, deammonation products of sulfamide. By use of stoichiometric amounts of reactants, the following compounds were prepared: sodium imidodisulfamide from sodium hydroxide and sulfamide; potassium imidodisulfamide from potassium hydroxide and sulfamide; potassium bisimidotrisulfamide from potassium hydroxide, sulfamide, and potassium imidodisulfamide; potassium trisimidotetrasulfamide from potassium hydroxide and potassium imidodisulfamide. Evidence for the formation of these compounds included elemental analyses, establishment of reaction stoichiometry by the determination of ammonia liberated and product isolated, and the infrared absorption spectra.

Differential thermal analyses were performed on ammonium sulfamate and sulfamide. Ammonium sulfamate was not thermally decomposed to sulfamide at 155 °C. Sulfamide melts without decomposition but is thermally decomposed at 245 °C. The products of the decomposition were not identified. Aqueous solutions of sulfamide do not absorb ultraviolet light.

REFERENCES

- 1. Andreson, C. A., "A Critical Study of Sulfamide," School of Pharmacy, North Dakota Agricultural College, Fargo, N. Dak., June, 1947, M.S. Thesis.
- Andreson, C. A. and Miller, C. E., J. Am. Pharm.
 Assoc., Sci. Ed. 37, 204 (1948).
- 3. Battegay, \overline{M} , and Denivelle, L., Compt. rend. 194, 2216 (1932).
- 4. Battegay, M. and Denivelle, L., Bull. soc. chim. <u>53</u>, 1242 (1933).
- 5. Forbes, G. S. and Anderson, H. H., J. Am. Chem. Soc. 65, 2271 (1943).
- 6. Kirsanov, A. V. and Zolotov, Yu. M., Zhur. Obshcheĭ Khim. 20, 1650 (1950); J. Gen. Chem. (U.S.S.R.) 20, 1713 (1950) (Engl. Trans.).
- 7. Kirsanov, A. V., Zolotov, Yu. M. and Egora, N. L., Zhur. Obshcheĭ Khim. 20, 2251 (1950); J. Gen. Chem. (U.S.S.R.) 20, 2339 (1950) (Engl. Trans.).
- 8. Sisler, H. H. and Rosenbaum, D. M., J. Am. Chem. Soc. 74, 6130 (1952).
 - 9. Traube, W. and Reubke, E., Ber. 56B, 1656 (1923). 127 pages. \$2.00. Mic 57-794

I. DESIGN AND CONSTRUCTION OF AN AUTOMATIC RECORDING UNIT FOR A BECKMAN MODEL DU SPECTROPHOTOMETER.

II. A STUDY OF THE REACTION BETWEEN CALCIUM AND CERTAIN HYDROXYANTHRAQUINONES.

(Publication No. 18,266)

David French Westerat, Ph.D. University of Pittsburgh, 1956

I, A unit for the Beckman Model DU spectrophotometer was constructed for the purpose of recording

automatically the absorption spectra of a sample in the region of the spectrum from 220-900 millimicrons. The major problem in the design of such a unit is the compensation of the change in the response of a phototube as the wave length is varied. To accomplish this, a circuit was devised which adjusted the slit of the Model DU by an amount sufficient to maintain the output of the phototube constant. A housing which contained a mirror and phototube was mounted between the cell carriage and the end plate of the Beckman instrument. This mirror reflected a portion of the beam of radiant energy onto the phototube while allowing the remaining portion to pass through the sample and into the standard Beckman phototube compartment. The current from the phototube receiving the reflected radiation was amplified by a type 38 power-pentode acting as an electrometer tube. Any change in this amplified current was detected by a Brown "Continuous-Balance" amplifier which operated a motor coupled to the slit control shaft of the Beckman Model DU. In this way, a change in the output of the phototube caused the slit of the spectrophotometer to be adjusted until the output was returned to a fixed value.

A second phototube of similar type was located in the Beckman phototube compartment. Since this phototube received its radiation through the same slit, any change in its output was due solely to the absorbing characteristics of a sample placed in the cell compartment.

The recommended Beckman phototubes were replaced by more inexpensive R.C.A. vacuum phototubes. Type 935 was used from 220-600 millimicrons while Type 917 covered the range 600-900 millimicrons.

A Beckman Spectral Energy Recording Attachment was used to rotate the wave length shaft while either a Varian G-10 Graphic Recorder or a Brown Electronik Recorder was used to trace the output of the measuring phototube.

The instrument traced spectral transmittance curves with a reproducibility of 1-2 per cent and an accuracy of one per cent transmittance. Scans of either the ultraviolet or visible regions of the spectrum required about six minutes.

II. A series of substituted and unsubstituted hydroxy-anthraquinones were investigated as possible analytical reagents for calcium. As a result of qualitative tests, amarfin sodium sulfonate (1,5-dihydroxy-4,8-diamino-anthraquinone-2,6-disodium sulfonate) was selected for a detailed study. The reagent was purified by precipitating it with ethanol from aqueous solution. The purity of the precipitated compound was then estimated by a method which involved successive solubility determinations. A standard analytical balance was modified to provide weight-temperature curves from which the proper drying temperature was selected for use in the solubility determinations.

It was found that the addition of calcium to a solution of the reagent at pH 12.0 formed a reaction product which had an absorption peak at 710 millimicrons. Since the free reagent absorbed at 620 millimicrons, a spectrophotometric method of analysis seemed feasible. Using the method of continuous variations, it was determined that the reaction product consisted of one calcium atom for each reagent molecule. The experiments indicated that amarfin sodium sulfonate is able to detect calcium in concentrations as low as 0.1 part per million. 103 pages. \$2.00. Mic 57-795

CHEMISTRY, ORGANIC

THE SYNTHESIS OF PROTOLICHESTERINIC ACID, DIHYDROPROTOLICHESTERINIC ACID AND LICHESTERINIC ACID METHYL ESTER

(Publication No. 20,222)

Shirley Rosenberg Bach, Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor Eugene E. van Tamelen

The synthesis of protolichesterinic acid (I), an antibiotic extracted from Centraria islandica, and its transformation products, lichesterinic acid methyl ester (II), and dihydroprotolichesterinic acid (III), was accomplished.

Dihydroprotolichesterinic acid was synthesized by the following route. Methyl α -methyl- β -carbomethoxy- γ -ketoheptadecanoate (IV) was prepared by the condensation of ethyl α -bromopropionate and methyl myristoylacetate. (IV) was then reduced with sodium borohydride and hydrolyzed in aqueous-methanolic potassium hydroxide. Acidification of the potassium salt which precipitated in the hydrolysis medium afforded, after purification, dl-III, m.p. 114-115°. A diastereoisomer, dl-isodihydroprotolichesterinic acid (V), m.p. 134-135°, was obtained by acidification of the hydrolysis solution after removal of III.

Dehydrogenation of methyl dl-dihydroprotolichesterinate by sulfuryl chloride resulted in formation of methyl dl-lichesterinate, characterized by comparison of its infrared spectrum in chloroform solution with that of the product derived from the natural source.

Protolichesterinic acid was secured through the following route. Methyl tridecylglycidate, obtained from methyl 2-hexadecenoate by epoxidation with trifluoroperacetic acid, was condensed with dimethyl malonate to form α,β -dicarbomethoxy- γ -tridecyl- γ -butyrolactone. Hydrolysis in aqueous-methanolic potassium hydroxide gave a

$$CH_{3}(CH_{2})_{12}CH = CHCOOCH_{3} \xrightarrow{CF_{3}COOOH} CH_{3}(CH_{2})_{12}CH \xrightarrow{O} CHCOOCH_{3}$$

$$CH_{2}(COOCH_{3})_{2} \xrightarrow{COOCH_{3}} COOCH_{3}$$

$$CH_{3}(CH_{2})_{12} \xrightarrow{O} O$$

$$COOCH_{3} \xrightarrow{COOCH_{3}} COOCH_{3}$$

$$CH_{4}(CH_{2})_{12} \xrightarrow{O} O$$

$$COOH \xrightarrow{COOH} COOH \xrightarrow{1. (C_{2}H_{3})_{2}NH + CH_{2}O} \underline{dl} - I$$

$$CH_{3}(CH_{2})_{12} \xrightarrow{O} O$$

monopotassium salt. This salt, when treated with diethylamine and formaldehyde, gave, after acidification and purification of the product by chromatography on silicic acid, dl-I, m.p. 100.5-101.5°. The synthetic material was identified by its infrared spectrum, conversion to dl-lichesterinic acid, and hydrogenation to dl-III.

99 pages. \$2.00. Mic 57-796

THE PREPARATION AND REARRANGEMENT OF SOME CYCLOHEXADIENONES

(Publication No. 19,809)

Robert James Crawford, Ph.D. University of Illinois, 1956

The dienone, 6-allyl-2,6-dimethyl-2,4-cyclohexadienone (I) was prepared and the rate at which it rearranged to form 4-allyl-2,6-dimethylphenol (II) and allyl 2,6-dimethylphenyl ether (III) was measured. The rate constant was obtained by measuring the disappearance of the dienone by ultraviolet spectrophotometry. The concentrations of the products of the rearrangement were determined and the values of k_{-1} and k_{2} for the para Claisen rearrangement were compared with k_{1} obtained by other workers, by extrapolation to 171° .

 $k_1 = 7.34 \cdot 10^{-5} \text{ sec.}^{-1}$ $k_{-1} = 2.10 \cdot 10^{-2} \text{ sec.}^{-1}$ $k_2 = 5.63 \cdot 10^{-2} \text{ sec.}^{-1}$

From these values, the concentration of the dienone intermediate I occuring in the rearrangement of III to II at 171° was calculated to reach its maximum concentration in 100 sec. (0.70% completion of III to II) and to be $9.5 \cdot 10^{-4}$ that of III at t = 0. This was checked experimentally by employing a peak at 303 m μ in I ($\epsilon = 4400$) where the ϵ for II and III is less than 4. The observed concentration of dienone, after 100 sec. at 172° , was $1.3 \cdot 10^{-3}$ that of III at t = 0.

The values of ΔS^{\ddagger} and E_a for the rearrangements were found to be:

I to II, $\Delta S^{\ddagger} = -7.1$ e.u., $E_a = 26,800$ cal. mole⁻¹; I to III, $\Delta S^{\ddagger} = -8.8$ e.u., $E_a = 26,800$ cal. mole⁻¹.

The mechanism of the preparation of the dienone I from allyl bromide and sodium 2,6-dimethylphenoxide was investigated. The effects of the dielectric constant of the reaction medium, change in the cation, concentration, and the allylic halide were determined in diethyl ether solution. Only ortho-alkylation was observed, whenever Calkylation occured. The cation is postulated to be in the transition state for Calkylation of this type. The dienone formation was shown to parallel the amount of ion aggregation present in the reaction medium.

127 pages. \$2.00. Mic 57-797

THE REACTION OF AROMATIC SULFINIC ESTERS WITH HYDROGEN CHLORIDE AND CHLORIDE ION

(Publication No. 19,516)

Richard T. Dickerson, Ph.D. Rensselaer Polytechnic Institute, 1956

Research Professor: Dr. Harry F. Herbrandson

The kinetics and mechanism of the epimerization of the levorotatory 1-menthyl esters of benzenesulfinic (I), p-toluenesulfinic (II), and p-methoxybenzenesulfinic (III) acids in nitrobenzene solution under catalysis by hydrogen chloride and chloride ions have been studied at 25°. The product of the reaction is an equilibrium mixture of the levo- and dextrorotatory diastereoisomeric 1-menthyl arylsulfinates. Under these conditions it was found that hydrogen chloride and chloride ion combine to form the bichloride ion, HCl₂. The kinetics are termolecular, the rate of approach to equilibrium being first-order in ester, uncombined hydrogen chloride and uncombined chloride ion. The bichloride ion shows approximately one-twentieth of the activity of chloride ion as catalyst, whereas on hydrogen chloride donating activity was apparent.

1-Menthyl 1-p-bromobenzenesulfinate (IV) and methyl benzenesulfinate (V) were also prepared. IV was not studied kinetically. I, III, IV, and V have not previously been reported in the literature.

167 pages. \$2.20. Mic 57-798

THE RELATIVE REACTIVITIES OF SOME ALKYL GROUPS

(Publication No. 18,988)

Milton Eugene Fuller, Ph.D. Northwestern University, 1956

The work in this thesis was undertaken with the general objective of measuring the relative reactivities of different alkyl groups by cleaving mixed alkyl ethers with anhydrous hydrogen bromide and determining the composition of the resulting alkyl bromides. It was desired to establish the general relationship between the structure of the alkyl group and the mechanism of the reaction.

The ethers which were prepared and studied included methyl butyl, ethyl butyl, propyl butyl, dibutyl, isopropyl butyl, isobutyl butyl, cyclopentyl butyl, propyl isopropyl, propyl isobutyl, propyl 3-pentyl, dipropyl, and di-isobutyl ether; their infra-red spectra were recorded.

The experimental work was divided into three general categories:

- (1) The composition of the mixed alkyl bromides obtained from the cleavage reaction was determined.
- (2) The determination of the effect of hydrogen bromide concentration upon the composition of the reaction products was made.
- (3) The relative reactivities of ethers and alcohols reacting with hydrogen bromide were determined.

The relative reactivities of the different alkyl groups are shown in Table I. The primary alkyl groups were found to vary in the sequence that is typical of bimolecular nucleophilic substitution. With increasing concentration of hydrogen bromide, a condition which would favor bimolecular substitution, the secondary alkyl groups were

TABLE I

Relative Reactivities of Some Alkyl Groups
(Butyl = 1.000)

| Mole | Alkyl Group | | | | | | | |
|-----------------|-------------|-------|--------|-------|---------|----------|----------|-----------------|
| Fraction HBr | Methyl | Ethyl | Propyl | Butyl | i-Butyl | i-Propyl | 3-Pentyl | Cyclo Pentyl |
| 0.59 | 11.96 | 1.079 | 1.075 | 1.000 | 0.058 | 0.804 | 4.30 | 2.07 |
| 0.67 | 11.96 | 1.079 | 1.075 | 1.000 | 0.058 | 0.942 | 4.53 | 4.00 |

found to decrease in relative reactivity while there was no significant effect upon the primary groups. It is believed that the mechanism of the secondary alkyl ether cleavage is of mixed type. The primary alkyl ethers are known to undergo bimolecular nucleophilic substitution, while the tertiary ethers react unimolecularly.

The relative reactivities of the alkyl groups as determined in this investigation are compared with the relative reactivities as determined by the reaction of hydrogen bromide with the corresponding aliphatic alcohols in aqueous phenol; there is very close agreement between the two investigations.

The relative reactivities of butyl ether and propyl alcohol and butyl ether and isopropyl alcohol were determined by the reaction of hydrogen with the respective mixtures. At 0.65 mole fraction hydrogen bromide, butyl ether reacted 5 times faster than propyl alcohol and 9 times faster than isopropyl alcohol; however, the relative reactivities were almost equal at 0.33 mole fraction hydrogen bromide. The relative basicities of the reacting compounds are believed to cause this phenomenon; alcohols are more basic than ethers.

In most cases, the mixed alkyl bromides were analyzed by infra-red techniques. The necessary alkyl bromides were obtained in a high degree of purity, and their infrared spectra were recorded.102 pages. \$2.00. Mic 57-799

SYNTHETIC APPROACHES TO THE YOHIMBINE SYSTEM

(Publication No. 20,247)

Gordon Grayson Knapp, Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor Eugene E. van Tamelen

PART I:

The reaction of Δ^1 -piperideine with indole and some 2-and 3-substituted indoles was studied. The Δ^1 -piperideine was found to give $\beta(2$ -piperidyl)indole(I) and α -methyl $\beta(2$ -piperidyl)indole(II) with indole and 2-methyl indole respectively.

$$\begin{array}{c|c} H & H \\ \hline \\ H \\ \hline \\ H \\ \hline \\ H \\ \hline \\ H \\ CH_3 \\ \Pi \\ \hline \\ H \\ CH_3 \\ \Pi \\ \end{array}$$

Condensation with indole of the alkanolamine obtained by controlled reduction of N-methyl-2-piperidone, yielded N-methyl- β (2-piperidyl)indole, which was identical with the N-methyl derivative of I.

The nature of the product II was proved by its synthesis through an alternate route: catalytic reduction of the indole obtained by Fischer cyclization of α -pyridyl acetone phenylhydrazone.

PART II:

The alkylation reaction of imides with β -phenethyl bromide and β -indolylethyl bromide was studied. Succinimide was N-alkylated with β -phenethyl bromide, and glutarimide gave the corresponding N-alkylated products upon reaction with β -phenethyl bromide and β -indolylethyl bromide.

trans-1,3-Diketo decahydroisoquinoline was N-alkylated with β -indolylethyl bromide to yield N- β -indolylethyltrans-1,3-diketo decahydroisoquinoline (III), which possesses the A-B-D-E rings of the yohimbine skeleton.

PART III:

Part III describes the continued study of the synthesis of yohimbine, initiated in the Wisconsin laboratories in 1954. The synthesis has progressed to stage IX.

The steps leading to VIII were scrutinized and improved, considerably better yields of intermediates VI and VII being achieved. A new method was found for decarboxylation of glycidic acids: on being heated in ethylene glycol, the glycidic acid V yields the keto acetal X convertible by hydrolysis to the keto aldehyde VII.

The stereochemical homogeniety of intermediates IV and VII was determined. 103 pages. \$2.00. Mic 57-800

I. THE ALKYLATION OF ENEAMINES. II. SYNTHESIS OF 2,3-DIMETHOXY 1-CARBOMETHOXY-1,3-BUTADIENE.

(Publication No. 20,057)

Hans Kurt Landesman, Ph.D. Columbia University, 1956

The reaction of eneamines with alkyl halides, reactive halides, anhydrides and α - β unsaturated nitriles, esters and ketones was investigated in order to determine its applicability to synthetic problems.

A reaction for the conversion of Schiff's bases to eneamines was found, thereby establishing a general synthesis of eneamines.

A literature synthesis of azetidine was modified to give 40 - 60% yields of the base from readily available starting materials. A number of new alkyl pyrrolidines were synthesized and their eneamines prepared. It was found that alkyl groups in the 2 position of the base considerably lowered the yields of C alkylated products.

An increase in the dielectric constant of the medium in the reaction of alkyl halides and eneamines improved the yields of C alkylated products.

A convenient synthesis for 2-methoxymethyl cyclohexanone, 2-formyl cyclohexanone and cyclohexanedione dioxime was developed by the reaction of α -chloromethyl ether, formic acetic anhydride and nitrosyl chloride, respectively, with the eneamine of cyclohexanone.

Addition of ethyl crotonate and methyl methacrylate to the eneamine gave the new keto esters ethyl-3-(2-oxocyclohexyl)-butyrate, and methyl-1-methyl-2-(2-oxocyclohexyl)-propionate in excellent yields.

Unsaturated ketones reacted smoothly with eneamines offering a very flexible synthesis of bicyclic unsaturated ketones such as octalones and tetrahydro indanones.

Acrolein was found to react with the eneamine of cyclohexanone to yield 2-N-pyrrolidylbicyclo[3,3,1]nonan-9-one.

A similar reaction was observed with the eneamine of cyclopentanone. The bicyclic bases thus obtained could be converted through base treatment of their methiodides to Δ -4-5 cyclooctenoic acid and Δ -4-5 cycloheptenoic acid respectively.

The eneamines of α -substituted cyclohexanones were found to react on the α' carbon giving rise to α, α' dialkylated cyclohexanones.

In an unrelated investigation a synthesis of 2,3-dimethoxy-1-carbomethoxy-1,3-butadiene was developed, an attractive intermediate for the total synthesis of reserpine and related alkaloids. 88 pages. \$2.00. Mic 57-801 THE SYNTHESIS AND POLYMERIZATION OF BICYCLIC DIENES, AND BROMIDES RELATED TO THE DIELS-ALDER ADDUCT OF CYCLOPENTADIENE AND MALEIC ANHYDRIDE

(Publication No. 17,811)

William Burrows Lawson, Ph.D. University of Maryland, 1956

Supervisor: Professor William J. Bailey

The synthesis of 2,3-dimethylenebicyclo-(2.2.2)-octane was accomplished in eight steps from catechol in a 33% over-all yield. Both 2,3-dimethylenebicyclo-(2.2.2)octane and 1,3-cyclohexadiene, a crucial intermediate in the synthesis, were prepared in good yield by the pyrolysis of diacetates. The structure of 2,3-dimethylenebicyclo-(2.2.2)-octane was proved by analysis, infrared and ultraviolet absorption spectra, the formation of a crystalline dimer, and the formation of two solid Diels-Alder adducts. The ultraviolet absorption spectrum of 2,3-dimethylenebicyclo-(2.2.2)-octane violated Woodward's Rules with a shift toward the visible, possessing a maximum at 247 millimicrons. Polymerization of 2,3-dimethylenebicyclo-(2.2.2)-octane in a peroxide-catalyzed emulsion system produced a polymer which softened at about 190°, and which probably possessed a molecular weight at least in the order of magnitude of 40,000. Infrared studies on the polymer indicated that it was composed of 85% of cis 1,4-units and 15% of 1,2-units.

The synthesis of 2,3-dimethylenenorbornane was accomplished by two routes, both of which started with 5norbornene-endo-2,3-dicarboxylic anhydride. In the more desirable of these routes, the diene was obtained using a five-step synthesis in an over-all yield of 44%. The less satisfactory of these routes utilized a four-step synthesis, and gave the diene in a 33% over-all yield. Each of these routes involved the pyrolysis of endo-2,3-di-(acetoxymethyl)-norbornane as the final and crucial step. The structure of 2,3-dimethylenenorbornane was proved by analysis, ultraviolet and infrared absorption spectra, ozonolysis to known compounds, and conversion to two solid Diels-Alder adducts. The ultraviolet absorption spectrum of 2,3-dimethylenenorbornane violated Woodward's Rules with a shift toward the visible, possessing a maximum at 248 millimicrons. Polymerization of 2,3-dimethylenenorbornane in a peroxide-catalyzed emulsion system produced a polymer which softened at about 90°, and which probably possessed a molecular weight at least in the order of magnitude of 50,000. Infrared studies on the polymer indicated that it was composed of 70% of cis 1,4units and 30% of 1,2-units.

The structure of the dibromide of the Diels-Alder adduct of maleic anhydride and cyclopentadiene was shown to be exo-5,6-dibromonorbornane-endo-2,3-dicarboxylic anhydride. This structural assignment was based upon reduction of the dibromo anhydride by hydrogenolysis to norbornane-endo-2,3-dicarboxylic anhydride, and by lithium aluminum hydride to endo-2,3-dimethylol-5-norbornene, and information recorded in the literature. The structures of two other dibromo anhydrides related to exo-5,6-dibromonorbornane-endo-2,3-dicarboxylic anhydride were deduced in a similar manner. Partial reduction of endo-2,3-dicarbomethoxy-exo-5,6-dibromonorbornane with lithium aluminum hydride led to a

dibromo alcohol, the structure of which was not determined. In the course of attempts to determine the structure of the dibromo alcohol, various other unknown compounds were prepared. 110 pages. \$2.00. Mic 57-802

THE STERIC EFFECTS OF METHYLENE GROUPS

(Publication No. 19,204)

Erich Marcus, Ph.D. University of Minnesota, 1956

In this work a considerable decrease in intensity of benzcycloalkenes was found for the near ultraviolet absorption band in proceeding from benzcyclobutene to benzcycloheptene. However, the trend is reversed in the case of benzcyclooctene. In the table below λ_{\max} and ϵ_{\max} are given for the peak of longest wave length of the B-band.

| Compound | n_{μ} | $\epsilon_{ m max}$ in 95% ethanol | $\epsilon_{ m max}$ in isooctane |
|------------------|-----------|------------------------------------|----------------------------------|
| benzcyclobutene | 271.5 | 1860 | _ |
| benzcyclopentene | 273.5 | 1450 | 1500 |
| benzcyclohexene | 274 | 627 | 620 |
| benzcycloheptene | 271.5 | 292 | 277 |
| benzcyclooctene | 272 | 344 | 325 |
| o-xylene | 271 | - | 204,212 |

A comparison of o-xylene with the benzcycloalkenes shows that cyclization causes a considerable increase in intensity of absorption. The absorption is strongest in the most rigid benzcycloalkenes. The largest difference exists between the five- and the six-membered ring compound. Further support for this large difference and the effect of cyclization was obtained from a study of 1,2,4,5-tetrasubstituted benzene derivatives in 95% ethanol. (See data below.)

| Compound | $\lambda_{\max} m\mu$ | $\epsilon_{	ext{max}}$ | |
|------------------------|-----------------------|------------------------|--|
| durene | 278 | 697 | |
| 6,7-dimethyltetralin | 281 | 1100 | |
| s-octahydroanthracene | 285 | 1950 | |
| 5,6-dimethylhydrindene | 282 | 2100 | |
| s-hydrindacene | 287 | 3850 | |

It appears that the data can be explained on the basis of hyperconjugation together with an application of the Franck-Condon principle. The more rigid a compound is in the ground state, the smaller will be the difference between the ground and the excited state, and the larger will be the transition probability. The flexibility of benzcycloalkenes increases as we proceed from benzcyclobutene to benzcycloheptene; but it decreases again as we proceed to benzcyclooctene because of intramolecular crowding.

Most striking is the similarity of the trend of the molar extinction coefficients of benzcycloalkenes (I) in 95% ethanol with the trend of the rates of hydrolysis of chlorodibenzcycloalkenylmethanes (II) in 90% acetone.

The ultraviolet absorption spectra of biphenyls of previously mentioned 1,2,4,5-tetrasubstituted benzenes were also studied. This study indicated that steric hindrance in the ortho positions of these compounds prevents any

| n | Relative ϵ_{\max} | Relative $\epsilon_{\rm int}^*$ | Relative Rates at | 0° | |
|---|----------------------------|---------------------------------|----------------------|--|---|
| 1 | 4.97 | 3,66 | 2.94 | (CH ₂) _n | I |
| 2 | 2.15 | 1.75 | 1.62 | H | |
| 3 | 1.00 | 1.00 | 1.00 | $_{n}\left(CH_{2}\right) / \left(CH_{2}\right) _{n}$ | п |
| 4 | 1.18 | 1.14 | 1.25 | Cı | |

 $^*\epsilon_{int}$ is the molar integrated extinction coefficient which was obtained by measuring the entire area of the B-band with a planimeter.

significant contribution involving quinoidal resonance forms which require coplanarity of the two benzene rings. It had been expected that the extinction coefficients of such non-planar molecules would be at least equal to the sum of extinction coefficients of the two benzene units, e.g. the extinction coefficient of biduryl would be expected to be about twice as large as the extinction coefficient of durene. However, it was found that the spectrum of 2,2',3,3',5,5',6,6'octamethylbiphenyl is more similar to the spectrum of pentamethylbenzene than durene. Similarly, transitions in 2,2',6,6'-tetramethylbiphenyl are probably more similar to those of 1,2,3-trimethylbenzene than 1,3-dimethylbenzene. 2,2',4,4',6,6'-Hexamethylbiphenyl has generally been considered as a classical example of highly hindered biphenyl derivatives. According to our studies its spectrum may be more similar to that of 1,2,3,5-tetramethylbenzene than 1,3,5-trimethylbenzene. 126 pages. \$2.00. Mic 57-803

THE SYNTHESIS OF α -ALKYL ACRYLIC MONOMERS AND SULFUR-CONTAINING OLEFINS BY THE PYROLYSIS OF ACETATES

(Publication No. 19,660)

Floyd Edmond Naylor, Ph.D. University of Maryland, 1956

Supervisor: Professor William J. Bailey

Methyl α -ethyl-, α -n-propyl-, α -isobutyl-, and α -n-hexylacrylates; α -n-propyl-, α -isobutyl-, and α -n-hexylacrylonitriles have been prepared from the corresponding methyl alkyl ketones. The methyl alkyl ketone cyanohydrins were prepared by a method similar to that described by Cox and Stormont. The cyanohydrins were acetylated with acetyl chloride and subsequently pyrolyzed at $375-400^{\circ}$ to yield 85 to 94% of the methyl α -alkyl acrylonitriles. In the preparation of the methyl α -alkyl acrylate monomers, the cyanohydrins were hydrolyzed by the method of Lyle and Lyle, seterified in a Clark-Rahrs methyl ester column, set of the cyanohydrins were hydrolyzed by the method of Lyle and Lyle, acetylated with acetyl chloride, and subsequently pyrolyzed to yield 85-94% of the acrylate monomers.

The monomers were polymerized in emulsion polymerization reactions to give polymers whose molecular weights were estimated to be 10,000.

It was thought that the failure of these compounds to homopolymerize when they had been prepared by dehydration or dehydrohalogenation reactions was perhaps due to the presence of isomers such as methyl tiglate and methyl angelate which could act as chain transfer agents.

Since the pyrolysis of acetates had been shown to be a

highly selective reaction, this was the method chosen for the attempt at the preparation of α -alkyl acrylic monomers which would be pure enough to polymerize. The fact that the acrylic monomers, when prepared by the pyrolysis of acetates reaction, would form high polymers is considered strong additional evidence for the selective elimination of primary hydrogens in this reaction.

Several sulfur-containing acetates were pyrolyzed to give sulfur-containing olefins in better yields than had previously been obtained. The olefins prepared by this method were methyl vinyl sulfide, methyl vinyl sulfone, 2-vinyl-thiophene and divinyl sulfide. The chief advantages of this synthetic method, other than an increase in yield, were the added convenience and the elimination of the highly unpleasant precursurs to the olefins, e.g., bis-(2-chloroethyl) sulfide, mustard gas, in the case of divinyl sulfide.

Methylisobutylcarbinyl thiolacetate and methylisobutylcarbinyl acetate were pyrolyzed under the same conditions. The thiolacetate was found to be more difficult to pyrolyze than the acetate. Infrared studies indicated that 4-methyl-1-pentene was the predominant product obtained in both reactions. The energy required to change from the grouping -S-Ç=O to -O-Ç=S was thought to be at least partially responsible for the increase in stability of the thiolacetate over the acetate.

80 pages. \$2.00. Mic 57-804

SYNTHESIS OF ALKYLATED POLYCYCLIC HYDROCARBONS: I. SOME METHYL SUBSTITUTED TRIPHENYLENES.

(Publication No. 20,361)

Thomas Alexander Neely, Ph.D. Kansas State College, 1957

Of the 719 possible methyl substituted triphenylenes, only six have been reported in the literature. The ultraviolet absorption spectra of only the parent hydrocarbon, triphenylene, has been reported. The object of this work was twofold: first, to synthesize several methyl substituted triphenylenes; secondly, to elucidate the ultraviolet absorption spectra of these compounds, and to note the effects of the various methyl substituents compared with the effects of similar substituents in other polycyclic hydrocarbons.

The self-condensation of cyclohexanone, 2-methylcyclohexanone, and 4-methylcyclohexanone with hydrogen chloride followed by treatment with aqueous sodium hydroxide, led to the corresponding β,γ -unsaturated bicyclic ketones which were hydrogenated to 2-cyclohexylcyclohexanone and its methyl derivatives. The Grignard reaction between 2-chlorocyclohexanone and p-tolylmagnesium bromide yielded 2-(p-tolyl)cyclohexanone. The 2,4-dinitrophenylhydrazones of all the ketones were prepared except that of 2-(2'-methylcyclohexyl)-6-methylcyclohexanone. The steric effect of the adjacent methyl group is apparently responsible for the failure of this ketone to form a 2,4-dinitrophenylhydrazone.

The ultraviolet absorption spectra of the 2,4-dinitrophenylhydrazones of the dimers of 2-methyl and 4-methylcyclohexanone confirmed their structures as being β , γ -unsaturated ketones.

The tertiary carbinols were prepared in Grignard reactions between the various saturated bicyclic ketones and arylmagnesium bromides. It was noted that steric conditions were unfavorable for the synthesis of some of these carbinols.

Dehydration of the carbinols was accomplished through the use of polyphosphoric acid. On the basis of spectral data and previously reported oxidative studies, it was concluded that the dehydration products were 2,3-substituted cyclohexenes.

By cyclodehydrogenation of the dehydration products, triphenylene, 1-methyltriphenylene, 2-methyltriphenylene, 2,6-dimethyltriphenylene, and 2,6,11-trimethyltriphenylene were obtained. Along with these last two triphenylenes, 1-phenyl-2-(p-tolyl)-4-methyl benzene and 1,2-di(p-tolyl)-4-methylbenzene were obtained, these products arising from the failure of cyclization to take place.

Trimerization of cyclohexanone and 4-methylcyclohexanone followed by dehydrogenation, led to triphenylene and 2,6,10-trimethyltriphenylene respectively. No 1,5,9-trimethyltriphenylene was obtained from the trimerization of 2-methylcyclohexanone and subsequent aromatization.

The dehydration of 1,2-di(p-tolyl)cyclohexanol followed by dehydrogenation gave rise to 1,2-di(p-tolyl)benzene. Attempts to prepare 2,11-dimethyltriphenylene by cyclization of this compound were not successful.

The ultraviolet absorption spectra of all the triphenylenes prepared were obtained. The only additional complexity that appears to be introduced into the ultraviolet absorption spectra of triphenylene with the introduction of methyl groups is the presence of an additional band or point of inflection around 346 m μ in all of the compounds studied except 2,6-dimethyltriphenylene. There is a general shift towards the longer wave lengths as the number of substituent methyl groups increases. The data obtained indicated that the wave length shift also depends on the position of substituents. The maxima of 1-methyltriphenylene tend to be at slightly longer wave lengths than those of 2-methyltriphenylene.

These observations from the ultraviolet absorption spectra of the methyl substituted triphenylenes are in agreement with the findings previously reported in the phenanthrene series.

The ultraviolet absorption spectra of the methyl substituted o-terphenyls were similar to the spectrum noted previously for o-terphenyl itself.

97 pages. \$2.00. Mic 57-805

I. THE COURSE OF FORMIC ACID REDUCTION OF ENAMINES.

II. THE COURSE OF MILD OXIDATION OF SATURATED TERTIARY AMINES.

(Publication No. 19,864)

Ronald Raymond Sauers, Ph.D. University of Illinois, 1956

Part I.

The reduction of α,β -unsaturated amines (enamines) with formic acid generally proceeds readily with formation of the corresponding saturated amines. β,α -Unsaturated amines do not react under normal conditions, while

neostrychnine (an enamine) in which the double bond is sterically constrained is also inert.

Treatment of a typical enamine, $\Delta^{1(10)}$ -dehydroquinolizidine, with formic-d acid gave quinolizidine-10-d, identical with an authentic sample prepared by reduction of 10-cyanoquinolizidine with LiAlD₄. Thus, the hydrogen appearing on the α -carbon of the reduced product has its origin on the carbon atom of formic acid.

on the carbon atom of formic acid. Reduction of $\Delta^{1(10)}$ -dehydroquinolizidine with ca. two moles of formic acid-d gave a deuterioquinolizidine containing two atoms of deuterium per molecule. That deuterium was confined to β -positions was shown by reduction of 1,3-dimethyl- Δ^2 -tetrahydropyridine (no β -hydrogen) with two moles of formic acid-d. Since the product contained less than one atom of deuterium per molecule, exchange is limited to β -hydrogens.

Comparison of calculated amount (1.5 atoms per molecule, assuming statistical distribution) with observed (2.0 atoms per molecule) deuterium in the product indicates that an isotope effect is in operation. Since purely the modynamic considerations lead one to predict a deuterium content of less than 1.5, isotopic distribution is apparently controlled by differences in zero-point energy between carbon-hydrogen and carbon-deuterium bonds (with negligible contribution from differences in oxygen-hydrogen and oxygen-deuterium bonds).

The feasibility of an intermediate formate ester $(R_2N-CH_2O_2CH)$ is considered. Whereas $\Delta^{5(10)}$ -dehydroquinolizidine perchlorate is readily reduced by potassium formate in ethanol, the reaction failed in water, acetic acid and formic acid. It is expected that ester formation is slight in the more highly polar solvents.

Typical ketones were inert to formic acid.

Part II.

Oxidation of saturated tertiary amines with mercuric acetate generally produces α,β -unsaturated amines. The mechanism of this reaction has been pictured as involving a mercurated complex which could decompose directly to the acid salt of the enamine.

Substitution of deuterium for hydrogen on the α -carbon decreased the rate of oxidation by a factor of at least 2.3, thus indicating the rate-determining step in the sequence.

The course of oxidation of 3-methyloctahydropyrrocoline with mercuric acetate was found to parallel the results with 4-methylquinolizidine in that the product isolated resulted from loss of the tertiary hydrogen located at the ring juncture (in prefernce to the one on the carbon atom containing the methyl group). In view of the unlikelihood of isomerization of the products, the results have been interpreted on the basis of strain in the respective transition states.

The feasibility of interconversion of iminium salts in special systems has been demonstrated in the attempted preparation of 2-phenyl-3-(p-methoxybenzyl)oxazolidine. Condensation of benzaldehyde with 2-(p-methoxybenzyl-amino)ethanol gave a high-boiling oil whose infrared spectrum and analysis supported an oxazolidine structure. Acid hydrolysis liberated both benzaldehyde and anisaldehyde. Basification liberated approximately equal amounts of 2-(benzylamino)ethanol and 2-(p-methoxybenzylamino)ethanol, thus demonstrating the presence of two oxazolidines.

Several oxidants were found ineffective on quinolizidine,

silver acetate being notable. Small amounts of 4-ketoquinolizidine were produced by oxidation with potassium permanganate. 137 pages. \$2.00. Mic 57-806

CYCLOPROPANES XV: 1-BENZOYL-6-NITROBICYCLO(3.1.0)HEXANE AND ITS BEHAVIOUR TOWARD ALKALINE REAGENTS

(Publication No. 18,962)

Richard Merrill Scribner, Ph.D. University of Minnesota, 1955

Adviser: Lee Irvin Smith

The purpose of this research was to prepare and study the compound 1-benzoyl-6-nitro(3.1.0)hexane (I) as a means of evaluating several mechanisms which have been proposed for the reaction of alkaline reagents with secondary nitrocyclopropyl ketones.

Acetylenic and allenic ketones have been considered (1,2,4,5) as possible intermediates in the formation of enol ethers or α -pyrones from secondary nitrocyclopropyl ketones. Compound I was prepared in order to test this hypothesis. Existence of an intermediate containing acetylenic or allenic linkages would be precluded in the case of I for such linkages are incapable of existing within sixmembered rings. Formation of the usual enol ether or α pyrone from I would constitute evidence that, in this particular case at least, acetylenic or allenic ketones are not necessary precursors to enol ethers or α -pyrones.

When I was treated with methanolic sodium methoxide it did not behave in a manner analogous to II. Instead of an enol ether, it formed two isomeric substances, C14 H17NO4, in yields of sixteen and twenty percent, respectively. It was not possible to positively identify these substances but tentative structures (VI and VII) were assigned which were commensurate with their mode of formation and their chemical and spectral properties. A third substance, C₁₃H₁₂N₂O₄, was isolated in one-percent yield and this was assigned the provisional structure IX. There was some evidence that all three compounds were derived from the hypothetical intermediate X. Attempts to prepare X by an alternative route failed.

When I was treated with methanolic sodio malonic ester it was converted into 1-benzoyl-2-(nitromethyl)cyclopentane (XI) instead of an α -pyrone.

Although these results do not prove or disprove any mechanism, they do favor the probability that either acetylenic or allenic ketones are involved as intermediates in the formation of enol ethers and α-pyrones from secondary nitrocyclopropyl ketones.

BIBLIOGRAPHY

- 1. Smith and Englehardt, J. Am. Chem. Soc., 71, 2671, 2676 (1949).
 - 2. Smith and Kelly, ibid., 74, 3305 (1952).
 - Smith and Davis, ibid., 76, 5376 (1954).
 Kohler and Smith, ibid., 44, 624 (1922).
- 5. Englehardt, Ph.D. Thesis, University of Minnesota, 1948. 76 pages. \$2.00. Mic 57-807

1,4 ADDITION OR GRIGNARD REAGENTS TO 9-PHENANTHRYL KETONES

(Publication No. 19,877)

Stanley Julian Strycker, Ph.D. University of Illinois, 1956

The action of Grignard reagents on certain 9-phenanthryl ketones has been investigated. 9-Mesitoylphenanthrene was prepared by treatment of mesitoyl chloride with 9-phenanthrylmagnesium bromide. This ketone was synthesized independently by the condensation of 9-phenanthroyl chloride with mesitylene in the manner of Friedel and Crafts.

The methyl and phenyl Grignard reagents were found to combine with 9-mesitoylphenanthrene in the 1,4 manner. The products were obtained as cis and trans dl pairs. Conversion of the cis- to the trans-dihydroketone was effected in the methyl addition series. 9-Mesitoyl-10phenyl-9,10-dihydrophenanthrene was found to be sensitive to air oxidation; 9-phenyl-10-phenanthrol was isolated and identified as one of the oxidative cleavage products.

Phenylmagnesium bromide reacted with phenyl 9phenanthroate and 9-benzoylphenanthrene in a similar manner. A product, 9-benzoyl-10-phenyl-9,10-dihydrophenanthrene-common to the two reactions, was isolated. Conversion of this substance to 9-phenyl-1,2,3,4-dibenzofluorence confirmed the structure.

Aromatization of the dihydromesityl ketones was accomplished by bromination. In the bromination of 9mesitoyl-10-phenyl-9,10-dihydrophenanthrene an

anomalous reaction was encountered. A mechanism is proposed for the formation of 9-phenylphenanthrene.

Attempts to prepare 9-phenanthrol from 9,10-phenan-

thraquinone and hydrazine were unsuccessful.

9-Mesitoylphenanthrene was reduced to the secondary alcohol by means of lithium aluminum hydride. Mild oxidation of the alcohol reconverted it to the original ketone.

104 pages. \$2.00. Mic 57-808

THERMAL DECOMPOSITION REACTIONS OF CYCLONONANE DERIVATIVES

(Publication No. 20,026)

Peter Richard Taussig, Ph.D. Cornell University, 1956

Major Professor: Alfred T. Blomquist

This investigation, concerning the decomposition reactions of cyclononane derivatives, was undertaken in continuation of studies in these laboratories to determine the effect of ring size upon the reactions of cycloalkanes.

The thermal decomposition of cyclononyl acetate at $500\pm10^{\circ}$ was found to give a pyrolysate (71-78%) which was comprised of 70% 1,8-nonadiene (I); b.p. $142-144^{\circ}$ (740 mm.), $n_{\rm D}^{25}$ 1.4260, d^{23} 0.748, and only 30% of the expected cyclononenes (II); b.p. $172-174.5^{\circ}$ (740 mm.), $n_{\rm D}^{25}$ 1.4775. By quantitative infrared methods, the analysis of II showed composition of 4.8% trans- and 88.6% cis-cyclononene.

Analysis of I was in agreement with the formula C_9H_{16} and quantitative hydrogenation indicated that two double bonds existed in the molecule. Oxidative ozonolysis of I yielded pimelic acid which when mix melted with an authentic sample showed no depression. The properties of I were very similar to those of 1,8-nonadiene reported by other workers and the infrared absorption spectrum was identical with that of 1,8-nonadiene prepared by pyrolysis of 1,9-nonanediol diacetate.

Thermal decomposition of cyclononyl-S-methyl xanthate at temperatures below 400° afforded pyrolysates containing only mixtures of cyclononenes; 40% trans- and 60% cis- cyclononene. However, at pyrolysis temperatures above 400°, 1,8-nonadiene began appearing in the products. At 500° the pyrolysate contained 50% I.

By subjecting cis- and trans-cyclononene to the pyrolysis conditions, it was found that they were the precursors to the 1,8-nonadiene found in the forementioned pyrolysates. cis-Cyclononene formed the open chain terminally unsaturated diene to the extent of 16-28%, whereas the trans-cyclononene cleaved to the extent of 85%. Thus, the most probable mechanism to account for the products found from the thermal decompositions of cyclononyl esters involved two transformations. Initially, a mixture of cyclononenes is produced by 1,2-eliminations and then is succeeded by partial cleavage of the cyclononenes to 1,8-nonadiene.

It is very likely that this cleavage of the cyclononenes is initiated by a transannular shift of a hydrogen from position five to position one.

81 pages. \$2.00. Mic 57-809

CHEMISTRY, PHARMACEUTICAL

ANALOGUES OF TETRACYCLINE

(Publication No. 20,234)

Richard Bruce Gabbard, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Edward E. Smissman

Since it has been reported that the antibiotic activity of tetracycline may be due to its ability to chelate essential microbiologic metallic cations, the syntheses of analogues of tetracycline which would be capable of chelation were undertaken.

The only successful synthesis of a tetracycline analogue was that of 1-(2-hydroxyphenyl)-3-(2-ketocyclohexyl)-propane-1,3-dione (I). This compound was obtained in 3-6% yields from the condensation of 4-ethoxycoumarin with cyclohexanone in the presence of sodium ethoxide. Coumarin was found to condense with cyclohexanone to give 19% yield of 2-o-coumarylcyclohexanone which was characterized as its monohydrate. 4-Ethoxycoumarin did not condense with 3-methoxy-2-cyclohexene-1-one to give 1-(2-hydroxyphenyl)-3-(2,4-diketocyclohexyl)-propane-1,3-dione. Neither did 4-hydroxycoumarin condense with cyclohexanone nor did ethyl 2,2-ethylenedioxycyclohexanecarboxylate condense with o-hydroxyacetophenone to give I. The mechanism for the condensation of 4-ethoxycoumarin with cyclohexanone was postulated as involving cleavage of the lactonic ring of 4-ethoxycoumarin prior to condensation with cyclohexanone sodium. Sodamide or triphenylmethylsodium were useless as condensation catalysts compared with sodium ethoxide.

Dihydropyran was found ineffective as a hydroxyl protecting reagent for 4-hydroxycoumarin, o-hydroxyaceto-phenone, or cyclohexane-1,3-dione.

In attempts at preparing 1-cyano-2,6-cyclohexanedione derivatives for condensations with 4-ethoxycoumarin, the reaction between cyclic anhydrides and ethyl sodiocyanoacetate was investigated. Succinic anhydride gave 17-21% yields of diethyl 2-cyano-3-hydroxy-2-hexendioate (II). Glutaric anhydride, in the presence of ethanol, gave 17-20% yields of ethyl hydrogen 2-cyano-3-hydroxy-2-heptendioate (III), 10-14% yields of diethyl 2-cyano-3-hydroxy-2heptendioate (IV), and very little neutral product suspected to be 1-cyano-1-carbethoxy-2,6-cyclohexanedione (V). In the absence of ethanol, glutaric anhydride gave 57% yield of III exclusively. N-carbethoxy-d-glutamic anhydride gave 7% yield of diethyl 2-cyano-3-hydroxy-4-N-carbethoxyamino-2-heptendioate (VI). The anhydride of N,Ndimethyl-d-glutamic acid could not be prepared without decomposition.

The disilver salt of III treated with ethyl iodide gave 30% yield of diethyl 2-cyano-3-ethoxy-2-heptendioate (VII). III refluxed in acetic anhydride gave the enol lactone, ethyl 2-pentanolidenecyanoacetate (VIII). IV or VII could not be cyclized to V by sodium ethoxide or potassium tertbutoxide. Neither could the enol lactone VIII be isomerized to V by sodium ethoxide, boron trifluoride, or thermal rearrangement. The dry distillation of II or IV gave very small amounts of neutral distillate of empirical formulae $C_{30}H_{46}N_2O_{13}$ or $C_{33}H_{53}N_2O_{12}$ respectively. These were not characterized further.

The infra-red absorption spectra of II, III, IV, VI, VII,

and VIII were extensively studied and several correlations were made for the nitrile, methylene, carbethoxy, enol, enol ether, and enol lactone groups. The infra-red and ultra-violet absorption data definitely established II, III, IV, and VI as enols rather than as their isomeric ketones. Infra-red absorption data given by the carboxylic acid III indicated that III exists as a cyclic lactol in equilibrium with its dimer.

In an attempt at preparing 1-cyano-2,6-cyclohexane-dione, the reaction between cyanogen chloride and sodium cyclohexane-1,3-dione was investigated. A theoretical yield of a liquid was obtained which showed the presence of a nitrile by infra-red absorption analyses. However, treatment of the product with hydroxylamine gave the dioxime of cyclohexane-1,3-dione after three days' standing. Attempts at separating 1-cyano-2,6-cyclohexanedione from cyclohexane-1,3-dione by partition chromatography were unsuccessful.

103 pages. \$2.00. Mic 57-810

CHEMISTRY, PHYSICAL

X-RAY FLUORESCENCE FROM THIN FILMS

(Publication No. 20,308)

Frederick Augustus Achey, Ph.D. Lehigh University, 1956

The object of this investigation was to study the fundamental relationships involved in the generation of fluorescent X-radiation and develop a new technique for measuring X-ray fluorescence in coating thickness determinations.

A mathematical explanation is advanced to predict the intensity of X-ray fluorescence from both thin films and massive samples. The observed fluorescent intensity is shown to depend on the wave length of the incident radiation and the thickness of the sample. Fluorescence from any element decreases at a predictable rate as the incident radiation progresses to wave lengths shorter than the K absorption edge of the element.

The fluorescence from thin films was investigated experimentally through the use of a differential filter system. The filters which had K absorption edges falling on both the short and long wave length side of the desired radiation are used to monochromatize the fluorescent beam. The filters are prepared by mixing the filter material of compound or elemental form with polystyrene, and pressure forming in a heated die. This forms a rigid filter disc which can be easily prepared for any X-ray density, is easily adjusted in thickness, and is not dependent on availability of metal foils.

In measuring coating fluorescence, previously prepared filters are balanced to transmit the undesired radiation from the base metal equally. Coating fluorescence will be transmitted unequally by the filters, and subtraction of the intensities observed with the two filters in the beam is due to the coating fluorescence falling in the pass band between the K absorption edges of the filters. This technique affords a simple method for isolation of a particular wave length range, and is particularly applicable for the

determination of coating thicknesses. Systems studied included tin and zinc coatings on steel, and nickel coatings on copper, steel, and copper plated steel. In all cases, fluorescence from the coating was measured by use of the differential filter technique. Minimum and maximum measurable coating thicknesses increase with increasing atomic number. The maximum measurable coating thickness will also increase as the incident wave length decreases.

Balanced filters were used to measure coating thickness by isolating base metal fluorescence. The observed intensity decrease with increasing coating thickness agreed with the results obtained from crystal reflection techniques.

97 pages. \$2.00. Mic 57-811

THE SPECIFICITY OF METALLIC CATALYSTS (PARTS I-IV)

(Publication No. 20,098)

Akira Amano, Ph.D. Princeton University, 1956

In an introductory part, the general concept of specificity in metallic catalysts is reviewed in terms of the activation energy of chemisorption and the heat of chemisorption with special reference to the classification as to the activity order of gases and metals recently reported by Trapnell (1953) and also to the electronic properties of gases and metals comprising the heterogeneous system. As a result of such considerations, one or more catalysts can be specified for a given type of reactions. It is further suggested that a certain allowance as to the activity order should be made when a metal exothermically dissolves a gas in question. Hydride and nitride formation may sometimes reduce the catalytic activity strongly and such effect is discussed with several examples.

In the second part, the decomposition of ammonia over ruthenium, thodium and palladium catalysts supported on alumina is studied to examine the activity order predicted from the foregoing discussion. The reaction is carried out with ammonia alone and admixed with hydrogen or nitrogen or both at approximately one atmosphere and at temperatures ranging from 300 to 600°C to obtain a complete set of kinetic data. Nitrogen is without influence, but hydrogen inhibits the decomposition more pronouncedly with palladium than with ruthenium. With ruthenium, the reaction is approximately 0.6th order with respect to ammonia and -0.9th order with respect to hydrogen. This kinetic equation is identical with that reported by Temkin and Pyzhew (1940) and therefore the slowest elementary step is the desorption of nitrogen molecule from the surface. The activation energy is obtained as approximately 30 kcal. for all three catalysts and the value is satisfactorily explained from the mechanism proposed. Decompositions between 2 and 10% are attained at temperatures ranging from 350 to 400°C over ruthenium catalyst and from 370 to 440°C over rhodium catalyst. With palladium, this extent of decomposition is secured only at temperatures ranging from 510 to 570°C. Therefore the activity order is determined as: ruthenium > rhodium >> palladium which accords with the discussion.

In the third part, the hydrogenation of benzene over

ruthenium, rhodium, palladium and platinum catalysts supported on alumina is studied to examine the further applicability of the activity order for more non-specific gases. The hydrogenation of benzene is carried out with a gaseous mixture of hydrogen, benzene and cyclohexane of varying compositions at approximately one atmosphere and at temperatures ranging from 25 to 225°C to obtain a complete set of kinetic data. With ruthenium, the reaction is approximately first order with respect to hydrogen, and zero order with respect to both benzene and cyclohexane. This kinetic equation is in accord with the effect of the pretreatment by the reactant gases on the initial activity of the catalysts. It is therefore concluded that the slowest elementary step of the reaction is either the surface reaction or the chemisorption of hydrogen. The activation energy is obtained as approximately 12 kcal, for all catalysts except palladium. The activity order is determined by the temperature at which 20% conversion is attained. The order is: rhodium ~ ruthenium > platinum > palladium which accords with the discussion except for palladium. The unexpected low activity of palladium is discussed on the basis of the exceptional solubility for hydrogen with some critical experiments. 92 pages. \$2.00. Mic 57-812

Temkin, M. and Pyzhew, V., Acta Physicochim. URSS., 12, 327 (1940).

Trapnell, B.M.W., Proc. Roy. Soc., A218, 566 (1953).

THE ASSOCIATION OF FERROCYANIDE IONS WITH VARIOUS CATIONS

(Publication No. 20,406)

Stephen Robert Cohen, Ph.D. Cornell University, 1956

Absorption spectra of aqueous solutions of thallous chloride, guanidinium chloride, potassium ferricyanide, and potassium ferrocyanide were measured in the visible and ultraviolet regions. The spectrum of potassium ferrocyanide deviates from Beer's law: the extinction coefficients for wave-lengths from 320 m μ to 250 m μ decreasing slightly as the concentration is increased, or as potassium, barium, or magnesium salts are added.

Using this effect, the association constants (corrected for the activities of the ions by the Debye - Hückel equation) were found to be 200 for the assumed ion-pair KFe(CN)₆ =, 7.2 x 10^3 for the assumed ion-pair BaFe(CN)₆ =, and 7.4 x 10^3 for the assumed ion-pair Mg(H₂O)_xFe(CN)₆ = (or MgFe(CN) =). There was some indication of the formation of the ion-triplet K₂Fe(CN)₆ = with a large excess of added potassium ion.

The distances of closest approach for these ion-pairs were computed by the Bjerrum - Fuoss theory of ionic association to be 4.53, 5.57, and 5.54 Å respectively, which agree with the estimated distances of 5.0, 5.0, and 5.6 Å.

Measurements of the association constant for barium and ferrocyanide ions in mixtures of iso-propyl alcohol and water indicate that the Bjerrum - Fuoss theory may be valid down to a dielectric constant of 70.7 (12.1 weight per cent of alcohol).

Absorption spectra also indicated the association of thallous chloride, of ammonium and thallous ions with ferrocyanide ions, and of guanidinium ions with ferricyanide ions. No significant changes in the spectrum of potassium ferricyanide were found to occur upon the addition of ammonium, tetramethyl ammonium, magnesium, barium, or thallous ions. 132 pages. \$2.00. Mic 57-813

CRYSTAL STRUCTURE STUDIES OF IRON CUPFERRON AND 2,2'-BIQUINOLINE

(Publication No. 17,947)

Robert Dégeilh, Ph.D. Indiana University, 1956

Iron cupferron crystallizes in the monoclinic system from an ether solution. The parameters, determined from oscillation photographs using the K_{α} radiation of iron are, a = 12.50 Å, b = 17.45 Å, c = 11.15 Å, β = 122°19′. The space group is $P_{21/a}$ and there are four molecules per unit cell. The number of observed reflexions is 1510 and the intensities of these were estimated visually and corrected by the usual correction factors. Several trial structures were derived from a projection of the Patterson function and from the calculation of the Patterson function in three dimensions, but no entirely satisfactory trial structure was found.

2,2'-biquinoline crystallizes in the monoclinic system from a cyclohexane solution. The crystals present a cleavage perpendicular to the b-axis. The parameters determined from Weissenberg photographs are, a = 11.61 Å, b = 3.94 Å, c = 13.92 Å, $\beta = 96^{\circ}49'$. The space group is $P_{2_1/a}$ and there are two molecules per unit cell. The number of observed reflexions is 207 and the intensities of these were estimated and corrected by the usual correction factors. A trial structure was derived from the consideration of the dimensions of the unit cell and from a projection of the Patterson function on the (010) plane. The x and z parameters were determined by electron density projections on the (010) plane. The orientation of the molecule with respect to the (010) plane was obtained from consideration of the projected and the expected bond lengths. The y parameters were determined by two leastsquares refinements and the last atomic positions were obtained from a least-squares refinement using all the hkl

The molecule is planar and centro-symmetric. The average C-N bond length is 1.38 Å and the average C-C bond length is 1.46 Å. The bond length between the two quinoline rings is 1.49 Å. This structure explains the observed cleavage.

46 pages. \$2.00. Mic 57-814

EQUILIBRIUM AND RECOVERY STUDIES ON NITROGEN OXIDES, AND THE HETEROGENEOUS DECOMPOSITION OF NITRIC OXIDE

(Publication No. 20,232)

James Mattison Fraser, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Farrington Daniels

The "Wisconsin Process" for thermal fixation of nitrogen produces nitric oxide from air to the extent of about 2%. The success of this process depends on the economical recovery of this nitrogen oxide.

Experiments were conducted on the recovery of nitrogen oxides from dilute air mixtures. The nitrogen oxides in these experiments were nitric oxide and nitrogen dioxide which is the product of the oxidation of nitric oxide by air. The efficiencies of adsorption of nitrogen dioxide on solid surfaces and of absorption of nitrogen dioxide in liquids were investigated. Among these substances were chlorinated ethers and organics, aqueous solutions of salts and acids and solid adsorbants.

The only adsorbants capable of adsorbing nitrogen dioxide in appreciable amounts were Pb_3O_4 supported on pumice stone and MnO_2 prepared in a particular manner and also supported on pumice stone. The adsorption of nitrogen dioxide by these oxides is actually a chemical reaction since the nitrates of lead and manganese are formed.

For Pb₃O₄ adsorption experiments 47% of the adsorption bed was Pb₃O₄ and the remaining 53% was pumice stone. This bed would repeatedly adsorb over 3% of its weight in NO₂, the theoretical maximum being 6.3% by weight. In experiments with MnO₂, 41% of the bed was MnO₂ and it was found that this adsorbant would adsorb over 25% of the weight of the total bed in NO₂. However, the preparation of active MnO₂ involves extensive dehy-

dration of $Mn(NO_3)_2$ and subsequent decomposition of the nitrate to MnO_2 .

Manganese dioxide adsorbs more than enough nitrogen dioxide to be commercially economical but the necessity for special preparation is a disadvantage. Red lead oxide does not require special preparation but adsorbs a rather small amount of NO₂. In addition, the temperature of decomposition of lead nitrate (470°C) is too high while in contrast manganese nitrate decomposes at about 250°C which would be suitable in the Wisconsin Process.

The dissociation constants for the reactions

 $N_2O_4 = 2 NO_2 K$

and

 $N_2O_3 = NO + NO_2$ K

are involved in the kinetics of the decomposition of nitric oxide especially when the decomposition is followed by colorimetric methods. Research on the kinetics of the decomposition of nitric oxide required a knowledge of these equilibria.

The data give optical densities of mixtures of the nitrogen oxides and titration values of the nitric acid formed on solution of these oxides in 10% $\rm H_2O_2$. Precise spectrophotometric measurements were made at 448 mu where $\rm N_2O_3$ is transparent and at 355 mu where it is absorbing. These measurements were made at 25°C and 45°C and

permitted a calculation of the dissociation constants and of the absorption coefficients for the various species present independently of any existing equilibria and thermodynamic data. The dissociation constant values determined in this research were found to agree quite well with those determined by other methods. Thermodynamic quantities were calculated and compared with those appearing in the literature.

The decomposition of nitric oxide below approximately 1050° C is predominately heterogeneous. This decomposition was studied in the temperature range between 740° C and 1040° C using various metal oxide surfaces as catalysts. Pellets of metal oxides were made and a vycor tube packed with these catalysts was used. The reaction was followed by measuring the concentration of NO_2 formed as a result of the reaction

$$2 NO + O_2 = 2 NO_2$$

which proceeds subsequent to the decomposition reaction which is

$$2 NO = N_2 + O_2$$
.

The concentrations of NO₂ were determined spectrophotometrically and the decomposition reaction was not allowed to proceed to over 50% completion thus insuring enough NO present to react with the oxygen formed.

The surface areas of the metal oxides used as catalysts were determined. These areas were calculated from the volume of nitrogen adsorbed at -194.7°C and the pressure at which it was adsorbed according to the BET theory and its mathematical formulations.

The heterogeneous decomposition of nitric oxide on these catalysts and at these concentrations was found to be zero order. The rate is independent of the concentration of NO and depends only on the nature and extent of the surface. Rate data were calculated and the various catalysts were compared. Calcium oxide, gallium oxide, aluminum oxide and possibly iron oxide were found to be better catalysts than chromium oxide, zirconium oxide and zinc oxide.

188 pages. \$2.45. Mic 57-815

THE REACTIONS OF COBALT(III) COMPLEXES IN VARIOUS SOLVENTS

(Publication No. 19,566)

Patrick Mark Henry, Ph.D. Northwestern University, 1956

Supervisor: Ralph G. Pearson

Part I is concerned with the following reaction in water;

$$[Co(NH_3)_5Cl]^{+2} + NO_2^- = [Co(NH_3)_5NO_2]^{+2} + Cl^-$$

The reactions in this study were followed either by potentiometric titration of the chloride ion released or spectrophotometrically.

It was found that in aqueous medium, this reaction proceeds by the following series of steps;

$$[Co(NH_3)_5Cl]^{+2} + H_2O = [Co(NH_3)_5H_2O]^{+3} + Cl^-$$

 $[Co(NH_3)_5H_2O]^{+3} + H_2O = [Co(NH_3)_5OH]^{+2} + H_3O^+$

 $[Co(NH_3)_5OH]^{+2} + N_2O_3 = [Co(NH_3)_5ONO]^{+2} + HNO_2$ $[Co(NH_3)_5ONO]^{+2} = [Co(NH_3)_5NO_2]^{+2}$

Part II of this thesis deals with the substitution reactions of cis-[Coen₂Cl₂]⁺ and some trans-[Co(AA)₂Cl₂]⁺ complexes with basic and non-basic reagents in methyl alcohol and ethylene glycol (where AA is a symbol for ethylenediamine or substituted ethylenediamines). In these solvents the direct reaction between the complex ion and the attacking reagent is presumably studied and the complicating aquation reaction which is found in water is avoided. Since a reaction with a reagent other than the solvent is being studied, the molecularity of these reactions can be determined and a mechanism may be inferred. Thus the effect of structure of the complex ion on various reaction paths may be determined.

These reactions were followed by chloride titration, loss of optical activity, radioactive chloride exchange and spectrophotometrically.

The reactions of the complexes with non-basic reagents are best explained on the basis of an S_Nl mechanism since the rate displayed no dependence on the concentration of the non-basic reagent and each complex had a rate of substitution which was independent of the non-basic reagent used. Furthermore the rate of substitution for the series of trans-[Co(AA)_2Cl_2]^+ complexes increased as the diamine part became more substituted. From this it was concluded that the rate of reaction of cobalt(III) complexes via an S_Nl mechanism increases as the complex becomes more hindered. Since the rates of aquation of this same series of complexes parallel the rates of substitution in methyl alcohol, it appears that both processes proceed by the same mechanism. The best interpretation is that both these reactions proceed by an S_Nl mechanism.

No definite evidence was found for a second process in the reactions of this series of trans complexes with basic reagents although the reaction was complicated by the reaction of these complexes with methoxide ion in the buffered reaction mixtures used. Rate constants for the reaction of these complexes with methoxide ion were calculated and found to parallel the rate constants for the reaction of these same complexes with hydroxide ion in water. Thus it would seem both reactions proceed by a common mechanism.

Cis-[Coen₂Cl₂]⁺ displayed a reaction with basic reagents in methyl alcohol, even when strongly buffered. The rate of this reaction depended on the concentration of the basic reagent. However, this was not a strict first order dependence since the rate levels off at high concentration of the basic reagent. The results are best explained on the basis of a mechanism involving reactive ion-pairs.

113 pages. \$2.00. Mic 57-816

KINETICS OF THE REACTION
OF PRIMARY AMINES WITH PIPERONAL

(Publication No. 17,611)

Richard Lee Hill, Ph.D. University of Virginia, 1956

The formation of a Schiff base from an aldehyde and a primary amine in alcoholic solution is a suitable example

for a study of the effect of amine structure on the rate of carbonyl addition reactions. In the present work, the rates of the uncatalyzed reaction of piperonal with the first eight members of the primary aliphatic amine series, in absolute methanol (ArCHO + RNH₂ \longrightarrow ArCH = NR + H₂O), have been measured at 0° , 25° , and 45° C. The effects on rate of a strong and a weak acid, strong alkali, salt, and water have also been determined. Selected equilibria have been studied briefly.

The reactions were followed by titration of the amine remaining in samples of the reacting solution (commonly 0.02 M in each reactant initially), using methanolic hydrochloric acid and brom cresol green or other internal indicator. A small empirical correction, determined as a function of both Schiff base and amine hydrochloride concentrations, was applied to compensate for the slight interference of the Schiff base in the titration. Rate measurements at 25°, using n- and/or s-butylamine, were also carried out in solutions containing added HCl, acetic acid, sodium methoxide, sodium chloride, and water, with only minor modifications of the analytical procedure. Equilibrium constants for formation of the Schiff bases of n-, s-, and t-butylamine at 25° were measured by analysis of reaction mixtures containing water.

These reactions are all second order and proceed nearly to completion in absolute methanol. At 0°C, the specific rates k in 1./mol.min. ±1.5% are: for R = Me, k = 1.15; Et, $0.5\overline{7}1$; n-Pr, 0.625; i-Pr, 0.159; n-Bu, $0.6\overline{90}$; i-Bu, 0.679; s-Bu, 0.173; t-Bu, 0.0160. The temperature coefficients are rather small. The equilibrium constants are of order 10²-10³ and parallel the rates roughly. High water concentrations produce a marked increase in k without materially affecting the equilibrium constant. Methoxide ion and dissolved salt do not change the rate. In presence of added acid, the rate was essentially that predicted by assuming complete neutralization of the acid by the (excess) amine; therefore alkylammonium ion is neither reactant nor catalyst. Owing to the low acidity of these reaction mixtures, however, general acid catalysis has not been ruled out, though the results with methoxide show that Schiff base formation can proceed without such catalysis.

Heats and entropies of activation have been calculated, and the effect of amine structure on reactivity discussed. Chain branching in the alpha position of RNH2 decreases k and increases $\Delta\,H^{\ddagger}$. But since entropy effects are important, the rate variations may not be explained in terms of potential energies alone. The rates are not related to amine basicity referred to hydronium ion, but a linear relation between log k and the free energies of dissociation of the corresponding amine-boron trimethyl addition compounds is observed. This shows that the two reactions are subject to similar structural effects and that rate does parallel amine basicity relative to a bulky reference acid, in accord with the accepted mechanism of carbonyl additions. Several other reactions of amines have been found to exhibit the same correlation.

109 pages. \$2.00. Mic 57-817

A KINETIC STUDY OF THE ACID-AND BASE-CATALYZED HYDROLYSIS OF 2- AND 5-FORMAMIDO-, ACETAMIDO-AND BENZAMIDOPYRIMIDINE

(Publication No. 18,097)

Harvey Jacobs, Ph.D. Temple University, 1956

This dissertation is concerned with the acid- and base-catalyzed hydrolysis of the formyl, acetyl and benzoyl derivatives of 2- and 5-aminopyrimidine.

The object of the investigation has been to compare the hydrolysis when the amino group is in the 2- or 5- position. Also, the effect of the formyl, acetyl and benzoyl groups on the hydrolysis of a given aminopyrimidine has been determined.

The preparation of the acetyl and benzoyl derivatives of both 2-amino- and 5-aminopyrimidine has been described in the literature. Slight modifications in given procedures were made when 2-acetamido- and 2-benzamidopyrimidine were prepared. Two new compounds, 2-formamido and 5-formamidopyrimidine have been synthesized.

The formyl, acetyl and benzoyl derivatives were chosen for investigation since analogous compounds have been studied in connection with both acid- and base-catalyzed hydrolyses of esters, amides and N-substituted amides. It can be reasoned that if relative orders of reaction prevail in similar compounds, the mechanisms are also likely to be analogous.

Data from the literature have been presented for the hydrolysis of compounds of the type RCOX where -X is -OR', -NH₂ or -NHC₆H₅ and R- is H-, CH₃- or C₆H₅-. When R- is varied, the rates of hydrolysis lie in the decreasing order $H > CH_3 > C_6H_{5}$.

The same order has been observed in the present work for the acid- and base-catalyzed hydrolysis of the formyl, acetyl and benzoyl derivatives of 2- and 5-aminopyrimidine. The effect of the substituent on the rate is shown to be due to changes in activation energy. The mechanisms given by Meloche and Laidler satisfactorily account for the activation energies in terms of the charge on the carbonyl carbon atom. It is postulated that the magnitude of this charge is controlled by an inductive or resonance effect, depending upon whether the methyl or phenyl group is considered.

When the position of the substituent is changed from the 2- to the 5- position of pyrimidine there is a decrease in the rate of hydrolysis and an increase in the activation energy. This is explained by the resonance structures of pyrimidine, the 2- position being more electron-deficient than the 5- position.

The rates of hydrolysis are always more rapid for the base- than the acid-catalyzed reactions. Yet there is no clear decrease in activation energy in all cases. It is concluded that the molecule-ion interaction during basic catalysis causes a more rapid rate than the molecule-molecule interaction present during acid catalysis.

For the base-catalyzed reaction, the oxygen-exchange results of Bender have been considered. It is shown that it is not necessary to assume that the intermediate is a symmetrical addition compound. The mechanism which is proposed in this dissertation satisfactorily accounts for oxygen exchange, and the rates of hydrolysis relative to exchange when esters and amides are compared. It also

explains the lack of oxygen exchange during the acid hydrolysis of amides. 150 pages. \$2.00. Mic 57-818

THE RELATIONSHIP OF THE SECOND VIRIAL COEFFICIENT TO POLYMER CHAIN DIMENSIONS AND INTERACTION PARAMETERS

(Publication No. 20,422)

Thomas Allan Orofino, Ph.D. Cornell University, 1956

In Part I, there is presented an analysis and extension of the Flory-Krigbaum theory for the interaction of a pair of polymer molecules, represented by gaussian distributions of chain segments about their respective centers of gravity. A useful approximation is given for the excluded volume integral of that theory. By means of this approximation, the theoretical expression for the second virial coefficient in the expansion of the osmotic pressure is satisfactorily represented by $A_2 = (const.) ([\eta]/M) ln [1]$ + $(\pi^{1/2}/4)X_1 + (\pi^{1/2}3^{3/2}/32)X_2$]. X_1 and X_2 are related to the thermodynamic interaction parameters X_1 , and X_2 , respectively, in the semi-empirical expression for the solvent chemical potential $\mu_1 - \mu_1^0 = RT \left[ln(1-\nu_2) + (1-1/x)\nu_2 \right]$ $+X_1 \nu_2^2 + X_2 \nu_2^3 + \dots$], where ν_2 is the volume fraction of polymer and x the ratio of molar volumes of polymer and solvent. Inclusion of the higher term $X_2 \nu_2^3$ (and X_2) constitutes a refinement over the Flory-Krigbaum treatment. It is shown that the influence of X2 may be appreciable for low molecular weights and in poor solvents; its effect vanishes as the molecular weight becomes large. However, if $X_2 \neq 0$, the temperature at which A_2 for a given polymer-solvent pair becomes zero will, in general, depend upon the molecular weight.

The theory of intramolecular interactions is also extended to take into account the analog of the term X_2 .

Interaction parameters (X_1) are calculated from second virial coefficients for a number of polymer-solvent systems, and these are compared with the X_1 values obtained from intrinsic viscosities (intramolecular theory). The good agreement obtained offers strong evidence for the general validity of the intermolecular (A_2) and intramolecular theories.

In Part II, the preceding treatment of the second virial coefficient is extended to polyelectrolytes in salt solutions. Each polymer molecule is assumed to be described satisfactorily by a gaussian distribution of chain elements about its center of gravity; each small region of volume within the molecular domains is considered to be in Donnan equilibrium with the external (salt) solution. Summation over all volume elements and subsequent integration over the coordinates of the centers of gravity of two neighboring polyelectrolyte molecules yields an expression for A_2 identical with that given in Part I but with X_1 and X_2 redefined as

 $X_{1} = 10^{3} (3^{3/2} / 2^{2} \pi^{3/2}) (1/NV_{1}) (MV_{1}/M_{1})^{2} (\overline{s^{2}})^{-3/2} (1/2 - X_{1} + V_{1}i^{2}/4V_{1}^{2}S^{*})$ $X_{2} = 10^{6} (3^{5/2}/2^{3}\pi^{3}) (1/N^{2}V_{1}) (MV_{11}/M_{11})^{3} (\overline{s^{2}})^{-3} (1/3 - X_{2} + V_{1}(z_{-}-z_{+})i^{3}/12V_{11}^{3}S^{*2})$

 M_u is the molecular weight of a segment, V_1 and V_u the molar volumes of solvent and segments, respectively, $(\bar{s}^2)^{1/2}$ the radius of gyration of a polymer coil, i its degree

of neutralization, and S* the ionic strength of the external solution.

An alternate approximation to the excluded volume integral, particularly applicable for large values of X_1 (large values of A_2), is also presented in this section.

The preceding relationships are applied to the results of experimental measurements on the system poly-(acrylic acid), NaCl, water. The agreement is qualitatively good although the osmotic effects of the small mobile ions are greatly depressed by the charges on the chains, particularly for high degrees of neutralization.

114 pages. \$2.00. Mic 57-819

DYNAMIC MECHANICAL PROPERTIES OF CELLULOSE NITRATE SOLUTIONS AND GELS

(Publication No. 20,257)

Donald John Plazek, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor John D. Ferry

Dynamic mechanical property measurements on solutions of cellulose nitrate in isophorone and diethyl phthalate were undertaken as part of a more general research program investigating the mechanical properties of viscoelastic materials whose ultimate purpose is the understanding of macroscopic mechanical behavior in terms of molecular processes. Dynamic property measurements, using J. D. Ferry's photoelastic wave propagation method and the Smith, Ferry and Schremp single transducer method, were made on 8 solutions of a roughly fractionated sample (number-average molecular weight 140,000) of cellulose nitrate with a nitrogen content of about 13.8%. Measurements were made on concentrations from 3.8 to 18.2% at temperatures from 0° to 60°C and frequencies from 160 to 3200 cps. When reduced to a reference state of unit viscosity and concentration, using steady flow viscosities obtained from falling ball and capillary measurements, these data provide single composite curves for dynamic rigidity and viscosity over a range of reduced frequency of about 4.5 powers of ten. The distribution function of relaxation times derived therefrom is a plateau with a height of about 10^{5.3} dynes/cm². Concentrated solutions of other cellulose derivatives (acetate, tributyrate) exhibit similar plateaus in the relaxation distribution function with heights ranging from 10^{5.1} to 10^{5.4} dynes/cm². Vinyl polymers of comparable molecular weight usually exhibit plateaus with a slope of about -0.30.

Brief investigation of gel formation found in the system revealed that the modulus of rigidity increased linearly with time at about the rate of $3x10^4$ dynes/cm²/hr. Gelled solutions frequently exhibited spherulitic formation.

Measurements with the double transducer of Fitzgerald and Ferry were made on a 23.0% solution of cellulose nitrate (nitrogen content, 12.6%; intrinsic viscosity in ethyl acetate at 25°C, 3.70 d1/g) in diethyl phthalate. The frequency range of measurement was 10 to 2800 cps and 14 temperatures from -47° to 35°C were covered in this investigation. The results in the form of components of the complex compliance superposed normally at the four highest measured temperatures (5°, 15°, 25°, and 35°C),

but did not at the lower temperatures. The data were reduced, using theoretical values for the temperature dependence shift factors, a_T, calculated from the Williams, Landel and Ferry equation, thus isolating the departure from normal behavior. This abnormal behavior is attributed to the presence of gelation which is crystalline in nature. Gelation deviations are found in cellulose tributyrate gels at much higher concentrations. The effect in the various calculated parameters with the exception of the loss tangent is an increasing shift of the dispersion with decreasing temperature, with the gelation-shifted portions of the curve maintaining the slope of the unaffected portion of the data. The loss tangent at temperatures below -10.0°C discloses a striking divergence which suggests, but not conclusively, that even measurements made at different temperatures below the gel point would merge if carried to low enough frequencies. The derived distribution functions of retardation times and relaxation times exhibit shifts similar to that observed in most of the dynamic mechanical parameters. The distribution function of relaxation times has the theoretical Rouse slope of -0.5, which is also closely adhered to by a 20% gel of cellulose tributyrate in dimethyl phthalate. Monomeric friction coefficients were calculated at various temperatures and showed an increase with increasing crystallinity, as would be expected. The value of the mentioned friction coefficient calculated at the glass transition temperature for the ungelled portion of the relaxation distribution function is appreciably larger than values found for vinyl polymers, but smaller than that for the above-mentioned solution of cellulose tributyrate.

152 pages. \$2.00. Mic 57-820

THE OXIDATION OF THE LOWER PARAFFIN HYDROCARBONS (PARTS I AND II)

(Publication No. 20, 151)

Clarence C. Schubert, S.J., Ph.D. Princeton University, 1956

Reaction rates of ozonized oxygen (ca. 3 mole % O₃) with methane, propane, n-butane and isobutane were measured, in situ, in a temperature-controlled infrared absorption cell by observing the decrease of ozone concentration as measured by the absorption at 1055 cm. activation energies calculated on the basis of a reaction first-order with respect to ozone were 14.9, 12.1, 11.1 and 10.3 kcal. respectively. The pre-exponential term for the methane-ozone reaction was found to be 7.2 x 1010, for propane-ozone 3.1 x 10°, for n-butane-ozone 8.2 x 10° and for isobutane-ozone 4.4 x 10⁸ cc. mole⁻¹ sec.⁻¹ estimated on the basis of a reaction rate ∞ [O₃]. [HC]. The isobutane-ozone reaction was predominantly homogeneous; n-butane-ozone showed some acceleration in rate due to increased Pyrex surface, little dependence on sodium chloride surface. The main gaseous product of the isobutane-ozone reaction was t-butanol with smaller amounts of acetone and 1-carbon products approximately equal to molar amounts of acetone. A mechanism based on the postulation of a low lying triplet state of ozone is presented.

The reaction of ozonized oxygen (ca. 3-6 mole % O₃)

with isobutane in the temperature range 110 to 270°C was compared with the slow uncatalyzed reaction with oxygen alone. The ratio of gram atoms of oxygen fixed in liquid product to moles of ozone added increased from 3.4 at 125°C to 4.2 at 200° and 5.0 at 225°. The ozone induced oxidation merges into the slow combustion reaction at ca. 265°C. Approximately one third of the condensed products of the isobutane-ozone reaction at 150°C was found to be t-butyl hydroxymethyl peroxide. The same peroxide was indicated to be a product of the isobutane-oxygen reaction at 270°C by a comparison of infrared spectra.

It is proposed that ozone may be the active intermediate responsible for chain branching during the slow combustion of hydrocarbons in oxygen. Ozone might result from the reaction:

$$RO_2 \cdot + O_2 \longrightarrow O_3 + RO \cdot$$

Ozone probably has the stability requirements to account for the cool flame reaction and negative temperature coefficient region observed in the combustion of hydrocarbons. Preliminary attempts to detect ozone during the slow reaction by observing the ultraviolet absorption in a 3-meter tube were unsuccessful due to general absorption in the 2500 A region.

The ozonide of isobutylene prepared by ozonization at -78°C was shown to have a negligible absorption in the infrared carbonyl stretching region ca. 5.7 microns. This is an argument in favor of the Staudinger formula for the ozonide structure.

A paper chromatographic method for the detection of formaldehyde and acetaldehyde by an adaptation of the xanthogenate-alcohol procedure is presented together with a description of an absolute method for the quantitative analysis of ozone in ozone-air mixtures.

93 pages. \$2.00. Mic 57-821

AN X-RAY CRYSTALLOGRAPHIC STUDY OF DISORDER IN CERTAIN HEXA-SUBSTITUTED BENZENE DERIVATIVES

(Publication No. 20,167)

Alexander Tulinskie, Ph.D. Princeton University, 1956

Quantitative X-ray crystallographic structure analyses have been carried out on 1,2 dichlorotetramethylbenzene and hexachlorobenzene. In addition, Brockway and Robertson's determination of hexamethylbenzene was reconsidered and investigated further.

Good single crystals of the foregoing compounds were grown either by slow evaporation of benzene or by slow cooling of ethanol. X-ray data were collected from oscillation, rotation and moving-film photographs. The equinclination Weissenberg technique was employed for obtaining the moving-film exposures. The data were then processed according to standard procedures in preparation for their subsequent analyses.

The crystal and molecular structures were all quite similar and were solved by trial and error methods. The space group requirements, the packing possibilities (unit cell dimensions), the consideration of outstandingly strong low and high order reflections and the general intensity distributions led to self-consistent trial structures. These were refined by conventional two dimensional Fourier methods, that is, by electron and difference density projections. The interatomic distances and the interbond angles, the intermolecular distances and the general nature of the molecular packing were as expected.

The dielectric and heat capacity data of these compounds indicate that a considerable amount of molecular freedom exists in the crystalline solid at room temperatures. The present analyses have clearly established the nature of this disorder as being pronounced anisotropic thermal vibrations common to all atoms in a molecule. In addition, an orientational disorder was observed in 1,2 dichlorotetramethylbenzene.

All the atoms in a given molecule displayed anisotropic thermal motions, the directions of maximum vibration between adjacent atoms making approximately 60° with each other. This pseudo-hexagon distribution immediately suggested that the molecules underwent rigid-body torsional vibrations, the vibrations being in the planes of the molecules and about their "six-fold" rotation axes.

An additional disorder, which was impossible to detect in the compounds possessing strict hexagonal symmetry, was observed for 1,2 dichlorotetramethylbenzene. Distinct chlorine atoms and methyl groups were not found at the substituent positions, but rather, a scatterer equivalent to about twelve electrons. This was due to an approximately random distribution of chlorine atoms and methyl groups among six crystallographically non-equivalent positions. Such a distribution would give the substituent positions a scattering power of eleven-and-two-thirds electrons.

The existence of the orientational disorder has been interpreted as arising from discontinuous molecular reorientations of $n\pi/6$. They are probably a consequence of the rigid-body thermal vibrations.

86 pages. \$2.00. Mic 57-822

A THERMODYNAMIC STUDY OF THE EFFECTS OF POLYPHENYL AND CARBONYL GROUPS

(Publication No. 19,938)

Leland Maynard Vaughan, Ph.D. Stanford University, 1956

This study was made in order to evaluate the enthalpy and free energy changes produced by replacing hydrogen atoms in hydrocarbons by phenyl groups or oxygen atoms to form polyphenyl compounds or ketones, respectively. The required data are heats of combustion and entropies from which the enthalpies and free energies of formation may be computed.

All enthalpies and free energies of formation were computed for the compounds in the liquid state at 25°C, although, for solids, this is a hypothetical state. The effects of substitution, however, are more readily apparent when the lattice forces in solids are eliminated.

Vapor pressures of cyclohexanol and cyclohexanone were measured by the isoteniscopic method of Smith and Menzies and were combined with gas-phase equilibrium data for these compounds in order to compute the enthalpy and free energy of formation of cyclohexanone in the liquid state from previously determined values for cyclohexanol.

Heats of combustion of diphenyl, dibenzoylethane, dibenzoylethylene, diacetyl, benzyl methyl ketone, and pbenzoquinone were measured by means of a bomb calorimeter. These heats of combustion, $-\Delta H_c^0$ and the heats of formation, $-\Delta H_f^0$, are given in the following table:

| Compound | $-\Delta H_c^0$ (kcal/mole) | $-\Delta H_f^0$ (kcal/mole) |
|-----------------------|-----------------------------|-----------------------------|
| Diphenyl (s) | 1493.30 (± 0.27) | - 23.10 (± 0.31) |
| Dibenzoylethane (s) | 1921.81 (± 0.33) | 61.24 (± 0.38) |
| Dibenzoylethylene (s) | 1887.18 (± 0.38) | 27.55 (± 0.43) |
| Diacetyl (1) | 493.56 (± 0.09) | 87.60 (± 0.10) |
| Benzyl methyl | | |
| ketone (1) | 1149.09 (± 0.17) | $38.96 (\pm 0.20)$ |
| p-Benzoquinone (s) | 656.84 (± 0.13) | 44.10 (± 0.15) |

Entropy data for the above compounds were obtained from the literature and were used to compute the free energies of formation. The heats and free energies of formation of these compounds were then compared with the corresponding values for the hydrocarbons from which they were derived in order to evaluate the effects of phenyl substitutions or oxygen substitutions yielding ketones. Additional data for polyphenyl compounds and ketones were obtained from the literature in order to extend the range of molecular structures involving these substitutions.

The effects of multiple phenyl substitutions into saturated hydrocarbons showed considerable regularity except for tertiary substitutions producing steric effects. The effects of substitutions in unsaturated hydrocarbons were decreased by resonance.

The effects of oxygen substitution into saturated hydrocarbons to form simple ketones were regular but substitutions into unsaturated hydrocarbons were complicated by resonance and steric effects. Diketones also exhibited dipole repulsions when the carbonyl groups were adjacent. 73 pages. \$2.00. Mic 57-823

A. NUCLEAR MAGNETIC RESONANCE SPIN-SPIN MULTIPLETS IN LIQUIDS. B. THE EFFECT OF PRESSURE ON SOME QUADRUPOLE INTERACTIONS.

(Publication No. 19,885)

George Abiah Williams III, Ph.D. University of Illinois, 1956

In high resolution nuclear magnetic resonance spectra one finds fine structure due to the chemical shift and spinspin coupling interactions. This work shows that it is possible to obtain the relative signs of the spin-spin coupling constants from the observed spectra. These relative signs can then be used to decide which of the several possible interactions leading to the couplings contributes the dominant term. It is shown that in the fluorobenzene derivatives studied, electron spin-nuclear spin interactions through the Fermi hyperfine interaction are the dominant terms for H-F and F-F couplings. Several other terms are also important.

The pressure dependence of the quadrupole coupling of Na²³ in NaClO₃ and NaBrO₃ was measured and is compared with the Cl35 pressure dependence as measured by others. These data are compared with the temperature dependences of the two couplings. 138 pages. \$2.00. Mic 57-824

ECONOMICS

ECONOMICS, GENERAL

ECONOMIC ASPECTS OF THE CONSERVATION OF SOIL, WATER, AND TIMBER RESOURCES

(Publication No. 18,229)

Bernard Hertz Friedman, Ph.D. University of Pittsburgh, 1956

Interest in the conservation of natural resources has undergone a remarkable resurgence during the past 25 years and, accordingly, there has developed an increasing need to contrive evaluative criteria for use in guiding programs. Because conservation programs have a major bearing on the allocation and utilization of major sectors of the nation's resources, the needed criteria must be based in considerable measure on the economic analysis of conservation policies and of their relationship to other objectives and policies.

Part A of this study defined conservation and considered recent quantitative estimates of the prospective supply of, and demand for soil, water, and timber resources. Conservation was defined as activities which seek to increase the availability of resources through time. The availability of resources encompasses the stock and flow of resources. Stock considerations embrace the quality of resources as well as their quantity. Flow considerations must evaluate the benefits possible from the alternative uses of resources. Above all, conservation is concerned with optimizing the distribution of resources through time. Specifically, soil conservation consists of activities which maintain the given quantity of soil and improve its quality. Water conservation consists of reallocating quantity, geographically and through time, and improving quality. Timber conservation consists of increasing and moving quantity and increasing quality.

Part B reviewed the major objectives served by a national policy for the conservation of soil, water, and timber. Individual sections dealt with the contribution which would result from a more efficient use of resources; the bearing of conservation on economic growth, military security, and in promoting economic stabilization; and the role of conservation in advancing recreation and education and in perpetuating the nation's environmental heritage. The bases for multiple-purpose projects were examined and the economic arguments against conservation were considered.

A number of analytic concepts were seen to underlie the above sections: (1) the continuous two-way interaction between conservation needs and programs and economic pressures and arrangements; (2) the need for conserving particular resources within a framework which recognizes the interacting effects of resource adjustments on one another; (3) the need to place local programs within a regional setting, and regional programs within a national setting; and (4) the need to integrate short-term, intermediate term, and long-term objectives into a unified development program.

Part C focussed attention on the processes by which the resources of the economy are allocated. Pre-emptive allocations were considered necessary to meet the nation's welfare objectives. Economic analysis can indicate the nature and magnitude of the costs which may be involved here and may aid in estimating the economic component of the benefit to be derived. But noneconomic considerations may well overshadow economic considerations. For commercial market allocations, economic analysis provides criteria for measuring the effectiveness of allocations in pursuit of individual profit. At the level of managerial decisions, whether public or private, technological criteria, which make performance possible, define the boundaries within which economic valuations can be used to choose among residual alternatives. Economic analysis can play an important role in effectuating already defined goals, although it cannot determine the relative desirability of alternative objectives if their benefits cannot be fully expressed in dollar values. Nor can economic analysis be used to compare different forms of burdens which cannot be fully expressed in dollar values. But it can be used to evaluate alternative arrangements for the purpose of determining the means of achieving specific benefits at minimum costs in terms of market values. The role of economics in conservation programming can be strengthened by the development of emerging analytical approaches such as national income, balance sheet and capital accounts, regional accounts, and minimum standards. 319 pages. \$4.10. Mic 57-825

AN ANALYSIS OF THE ICE CREAM INDUSTRY AS AN OUTLET FOR DAIRY PRODUCTS

(Publication No. 20,241)

Lawrence Wilber Haynes, Ph.D. The University of Wisconsin, 1957

Supervisor: Assistant Professor Walter H. Ebling

The general problem of the study was essentially to examine the general dairy industry and subsequently the ice cream industry, to note some of the most pressing present and probable future problems of resource allocation. As a final analysis, an assessment of both the data needs of the industry and the adequacy of present data systems for economic analysis was made together with suggestions for the future.

The method of approaching the problem was to start with an historical analysis of the industry leading up to its major development. In the analysis of the early history of the industry, development was found to have lagged behind that of other dairy products even though the technique of freezing ice cream was resolved fairly early. Self sufficiency in agriculture plus a conservative, almost stolid stability in the entire dairy industry retarded growth. On

the other hand, the generally favorable economic situation following the Civil War, a rapid expansion in milk production in the 1880's, and vigorous sustained leadership in the dairy industry promoted development. Two new uses, the ice cream cone and the ice cream soda, sparked the new industry.

The analysis suggested several points in the development of industries. General cultural development precedes economic activity. A formative development follows in which one innovator has an idea and successfully prosecutes it. Other firms organize and secondary industries develop or adapt as industry group consciousness emerges. A specific factor or set of factors "kicks off" production and firms vie with each other in the struggle for the market. As the industry approaches a period of maturity, infant industries emerge as parts of older sectors of the economy. These new industries then repeat the process and outmoded industries either increase at a lower rate or decline. The important factor appears to be one of balance in which new and struggling industries should receive the necessary capital and productive factors at an increasing rate in order to assure a dynamic economy.

Nutritionally, ice cream is a good source of proteins and carbohydrates. Of the vitamins, riboflavin and cyanocobalamin (vitamin B_{12}) occur in ice cream in good quantity. Likewise ice cream is a good source of calcium and phosphorous, and is palatable. From the data available, it appears that outside of development factors, the level of income is perhaps the most important factor in ice cream demand. The proportion of persons from about the lower twenty per cent to about the upper forty per cent of income units is a key factor. Cost curves of individual firms appear to be horizontal in slope and leave a fairly large area of flexibility where output could vary considerably with little change in average or marginal cost.

Prospects for the industry are good for the next year or so. For the next four or five years, a per capita increase of about twenty per cent is expected. In the next twenty to twenty-five years, an increase of thirty per cent in per capita consumption is well within the range of possibility.

Data available for the industry are fairly adequate to denote general trends — the most serious deficiency being data on the utilization of milk in condensed products and fluid milk consumption. There was also a noted deficiency in production and utilization data from other sectors of the economy. With increasing complexity of the economy, the importance of basic data was recognized. Suggested improvements included the strengthening of basic data systems. However, basic data systems were viewed as progressing by stages with the important objective seeming to be to precede rather than follow the time when data are needed for solving industry problems.

289 pages. \$3.75. Mic 57-826

FACTORS IN THE MARKET FOR SOYBEAN OIL MEAL IN THE UNITED STATES

(Publication No. 19,883)

Chester Millington Wells, Jr., Ph.D. University of Illinois, 1956

Three of the more important adjustments in the agricultural economy of the United States in recent years have

been the large increases in soybean production, in the use of high-protein feeds, and in the production and use of formula feeds. The market for soybean oil meal has been important to these adjustments. The large increases in use of high-protein feeds and the rapid expansion in production of formula feeds could not have come about without increases in supplies of soybean oil meal. The quantity of soybean oil meal used in mixed feeds exceeds, by far, that of any other single high-protein feed. The large expansion in soybean production could not have occurred without an adequate market for soybean oil meal. Each increase in production of soybean oil meal has been absorbed at a premium over the price of corn.

The rations of farm animals still do not contain sufficient amounts of protein for properly balanced nutrition. Until they do so, there will be an opportunity for expanding the market for soybean oil meal. Additional opportunities for market expansion are apparent when it is realized that still larger quantities of protein feeds will be needed to feed an expanding population according to presently accepted standards of human nutrition.

The purpose of this thesis was to estimate the amount by which and the rate at which the market for soybean oil meal may increase in the future.

The feeding of high-protein feeds and of formula feeds has increased relative to other concentrates. These changes have been closely associated with increases in feed conversion efficiency. The largest increases in consumption of high-protein feeds and of formula feeds have been by poultry. These birds also have made the greatest increases in feed conversion efficiency. Less striking, but of great importance, has been the improved feeding of hogs and the increases in feed conversion efficiency by these animals. The greatest opportunity for increasing the use of high-protein feeds and of formula feeds appears to be in hog feeding. The limited data available indicate that it would pay hog producers to eliminate at least part of the protein deficit in hog rations.

Soybean oil meal contains protein that is particularly effective in meeting the specific protein requirements of hogs and poultry. This fact has been recognized by the market and, through time, the demand for soybean oil meal has increased relative to the demand for other high-protein feeds, and for grains.

In 1950-54, high-protein feeds were fed at an average annual rate of 143 pounds per person. With no change in feeding practices, it will be necessary to increase consumption of these feeds about 180 thousand tons annually to take care of a 2.5 million annual increase in population.

This amount of annual increase can be considered a minimum. Consumption of high-protein feeds will likely continue to increase relative to consumption of other concentrates. Increases in the production of mixed feeds will increase the consumption of high-protein feeds relative to other concentrates. The rate at which the protein deficit is diminished will determine by how much the minimum annual rate of growth will be increased. Improvements in the balance of livestock rations will likely occur at an increasing rate in the immediate future.

Supplies of soybean oil meal appear to be more responsive to price changes than do supplies of other high-protein feeds. Consequently, most of the increase in consumption of high-protein feeds will be soybean oil meal.

132 pages. \$2.00. Mic 57-827

THE DEVELOPMENT AND TESTING OF METHODS OF MEASURING PRODUCTIVITY

(Publication No. 19,886)

Charles Zachary Wilson, Jr., Ph.D. University of Illinois, 1956

This study is directed toward an explanation of long-run productivity estimation problems which originate in inappropriate output measures. Consequently, the core of the project lies in the development and testing of productivity series based on a variety of output measures. The study has two basic objectives. One is to investigate the empirical meaning and adequacy of real value productivity concepts for individual industries. The other is to inquire into the nature of aggregate productivity series for two or more industries.

Individual industry productivity measures based on real value output series are theoretically superior to physical output measures. Three measures--real net value output per manhour, real gross value output per manhour, and real gross value output per unit of real material and fuel cost--have been developed and tested for each of twenty selected manufacturing industries for the period, 1919-1940. The test involves the comparing and contrasting of the three theoretical models as applied to the same industry for each of twenty selected industries. The findings contribute to the understanding of properties and possible usefulness of the real value productivity concepts. It thus becomes possible to determine the extent to which industry productivity estimation may be improved by altering the output measure.

A comparison of the growth rates of real net value output per manhour and physical output per manhour for the twenty selected industries over the period 1919-1940 reveals that significant dissimilarities occurred in only five of the industries. These findings suggest that the bias so frequently attached to long-run physical output per manhour estimates when used as a substitute for net output productivity concepts are generally insignificant.

A further analysis of the growth patterns of real gross value output per manhour and physical output per manhour discloses a high degree of similarity in both short and long run behavior. In addition to the obvious advantages of real gross value output--case of aggregation and avoidance of weighting problems--, these findings imply that index makers have been unduly selective in their choice of output measures for long-run productivity analysis. In view of the vast body of wholesale price data which can be used for deflation purposes, the use of real gross value output for long-run productivity estimations is a practical procedure.

Finally, an analysis of the growth patterns of real gross value output per unit of real material and fuel last show that the long-run growth rates are low but frequently positive and associated with high labor productivity growth rates.

To achieve the second objective of the study a number of aggregate productivity concepts are derived and then tested on an aggregate of twenty manufacturing industries over the period, 1919-1940. As in the case of individual industries, several aggregative theoretical models for the twenty industries are contrasted and analyzed. Particular attention is given to questions regarding the impact of sample size variations, choice of weighting systems, vari-

ations in the grossness of the production measure, and structural changes in the manufacturing sector over the period, 1919-1940.

The findings suggest that the growth rates of long-run productivity estimates for the manufacturing sector are not likely to be affected significantly by reasonable changes in sample size (given a lower limit), by reasonable variation in the weighting system, by the degree of grossness in the original data, or by limited changes in the structure of the industry group or sector.

Primarily, the study attempts to clarify the usefulness and limitations of alternative methods of measuring productivity—whether applied to a single industry or to an aggregate of industries. 175 pages. \$2.30. Mic 57-828

ECONOMICS, COMMERCE - BUSINESS

LABOR-MANAGEMENT RELATIONS IN THE GERMAN STEEL INDUSTRY, 1947-54

(Publication No. 20,106)

Werner Michael Blumenthal, Ph.D. Princeton University, 1956

Shortly after World War II a new system of almost equal sharing of managerial decision making, known as codetermination (Mitbestimmung), was introduced in a number of German steel producing companies. This dissertation has the fourfold objective of (1) showing briefly the origins of the codetermination idea in Germany, (2) analyzing the actual operation and experience with this system in some of the steel plants, (3) examining the effects on the labor-management relations process and on certain other economic factors, and (4) relating these data to other, already available labor-management relations studies, so as to promote the development of better theoretical frameworks for the analysis of labor problems in general.

Ten steel companies were studied in detail and intensive interviews conducted with labor and management representatives in various positions and at various levels within the companies. Statistical data relating to the impact of codetermination on the functioning of the companies were also collected wherever possible.

In summary, the major findings based on the above analysis were as follows: (1) Participation in economic decision making has long been an objective of German labor, with codetermination the latest in a long series of related arrangements toward this end during the last century. (2) Codetermination, in the companies studied, proved workable. Labor and management were able to work together, to improve the overall effectiveness of the enterprises and to avoid serious disagreements. (3) External factors partly accounted for this experience with codetermination. (4) Certain patterns of decision making which arose were also responsible. Elaborate techniques were developed among labor and management to compromise conflicting issues. The most important was the "horse-trading" of primary spheres of influence for each side, giving labor more than equal power over wages and

working conditions and bestowing on management an equal advantage in most other management matters. (5) The Labor Director occupies a key position in the labormanagement process under codetermination, determining in large part the character of the prevailing relationship. His personality and qualifications are crucial. He is in an anomalous position because of conflicting allegiances and the success of codetermination hinges on his ability to solve dilemmas arising from this anomaly. There is danger that he becomes "management-oriented" but this has not actually happened. He has generally guarded worker interests aggressively and achieved real gains for them. (6) Codetermination exerted upward pressure on wages and prices, but had no apparent effect on productivity, efficiency or output. (7) Codetermination had no marked effect on most phases of personnel management but intraplant communication, wage and salary administration and hiring, selection and layoff practices were improved. (8) Such indices of industrial climate as strikes, grievances and works council elections developed favorably under codeter-

The concluding analysis of these findings focuses on "underlying factors" in labor-management relations under codetermination, showing that "favorable" factors apparently outweighed "unfavorable" ones and that the success of the relationship can be explained in these terms. A final conclusion is that codetermination failed to solve basic economic problems but achieved real gains for labor, although probably at the consumers' expense. This system can operate effectively only under special conditions, as in Germany after 1945. Such conditions are not likely to exist in the United States.

338 pages. \$4.35. Mic 57-829

THE VALUE OF SPEED-FORCING DRILLS ADMINISTERED AT THE WORK STATION IN IMPROVING TYPEWRITING PROFICIENCY AND PRODUCTION

(Publication No. 19,983)

Opal Christensen, Ph.D. New York University, 1956

Chairman: Helen Reynolds

STATEMENT OF THE PROBLEM

The purpose of this study was to determine the value of a program of speed-forcing drills administered at the work station as a method of improving typewriting proficiency and production. The problem was divided into five parts:

- 1. To select and to equate the Work Station and the Job Experience Groups involved in the experiment.
- 2. To determine the materials and procedures to be used.
- 3. To administer the necessary practice materials and tests.
- 4. To secure, collate, and organize these data; to make the statistical comparisons among the data, and to interpret them for typewriting proficiency and production.
- 5. To determine the degree of retention of gains made, if any.

PROCEDURE

Two groups of typists known as the Job Experience and the Work Station Groups were organized at Hill Air Force Base in Ogden, Utah. The beginning proficiency and production rates were determined and recorded. Then for a period of four weeks (19 working days because one day was a holiday) the typists of the Work Station Group were given five 1-minute speed writes twice daily (at 10 o'clock and at 3 o'clock) during which time they worked for a daily increase of words typed without regard for errors except at the final 1-minute write of each group of five when they would type for "control." These typists also typed two five-minute tests each Friday and the better results of the two tests were considered to be the proficiency rating at that stage of the experiment.

At the end of the four-week period, all typists in both the Work Station and the Job Experience Groups were tested to determine whether change had occurred in their proficiency and/or production ratings. Also, after a period of 60 additional days, all typists were tested again to determine whether there was retention of gains made, if any.

RESULTS

Hypothesis I, that a program of speed-forcing drills administered at the work station will result in increased typewriting proficiency and production was accepted in the case of proficiency. At the end of the speed-forcing period the Work Station Group had shown improvements at the 1 per cent level of significance. Eighty-four per cent of the Work Station typists made improvement and the average increase was 4.04 CWAM. Twenty-nine per cent of the Job Experience Group improved with an average increase of .583 CWAM.

Hypothesis I was not accepted for production. Although the Work Station typists showed a decided improvement when compared to the Job Experience typists, the difference was not statistically significant at the 5 per cent level of significance. Sixty-two per cent of the Work Station Group showed improvement in production. The average increase was .45 CWAM. Thirty-five per cent of the Job Experience Group showed improvement with an overall change of .22 CWAM decrease.

Hypothesis II, that increased typewriting proficiency and production gained through at-the-work-station drills will be retained for at least 60 days, was accepted for both proficiency and production. The Work Station Group made improvement in both at the 1 per cent level of significance.

When the typists were grouped according to beginning proficiency rate it was found that the greatest improvement in proficiency was made by the 40-49 and 50-59 groups. The greatest improvement in production was made by the 40-49 and 60-69 CWAM groups.

182 pages. \$2.40. Mic 57-830

AN ANALYSIS OF THE CHANGES IN EMPLOYEE COUNSELING SINCE 1900

(Publication No. 19,985)

Henry Eilbirt, Ph.D. New York University, 1956

Chairman: Professor Herbert A. Tonne

The purposes of this study were, first, to discover the twentieth century innovations in employee counseling; second, to analyze immediate and more remote causative factors; and, third, to assess the impact on management.

Employee counseling was defined broadly as any interpersonal interviewing initiated by management to help an

employee who faces a problem.

Some industry "welfare" provision was found in 1900. Uncommonly, this included business utilization of special social or welfare secretaries, whose duties included individual counseling of employees.

Industrial medical personnel had appeared by 1900. Only after that date did their counseling function become apparent. Sometimes, this went beyond medical advice. As immediate antecedents, one notes the growing amount of litigation and legislation resulting from industrial injuries.

Between 1900 and 1920, the welfare movement changed into modern personnel administration. Those used as "employment managers" took over many duties of the earlier secretaries, including individual counseling. This movement emphasized correct placement and follow-up. One concomitant outcome was the emergence of training for foremen, in handling employees.

Employment management originated partly in welfare work, partly in application of "efficiency" methods which the contemporary engineers were introducing. The wartime labor shortage strongly stimulated the development.

Industrial mental hygiene applications began in the next decade as psychiatrists became interested in industry. The war had proved a valuable illustration of their success. General growth of interest in mental hygiene and the business search for antidotes to labor unrest at that time explain the appearance of mental hygiene in industry.

Psychologists did not engage in counseling in industry until a decade later when several began to function in accident proneness and problems of aging. Subsequent development of nondirective and psychodramatic techniques enlarged their counseling role.

So-called personnel counseling "arrived" in the Western Electric experiments. In its later phase this emphasized mental hygiene employing a methodology virtually identical to nondirection. The program was unexpected, but the experimentation followed the line of earlier work. The experimental structure, and the influence of Mayo predisposed the program in its ultimate direction.

Wartime employee counseling used the same name but embraced many forms of assistance and supervision for employees. It met the needs of a time which required the extraordinary wartime workforce. After the war, services diminished sharply.

A half century review suggests one counseling pattern is--"social service"--active assistance in handling various employee problems. Such service swells greatly during emergency periods (wars). Occupational counseling on job problems has become established. A "modern" counseling

program uses specialized counselors, familiar with mental hygiene, conscious of counseling methods, and generally without organizational authority. Often, counselors educate other company personnel in human relations.

Counseling was seen to stem from religious and charitable work, from the pursuit of efficiency in business, and from research in behavior. It is symptomatic of four twentieth century developments--management professionalization, heavy criticism of "capitalism," increasing industrial use of "scientists," and general interest in health and adjustment. The actual initiation of programs of this sort must be explained primarily in terms of individual executives and the institutional roles accepted by some business organizations.

Measured quantitatively, the impact upon management of the developments in employee counseling in the use of specialized personnel and methods seems slight. The ideas expounded by the innovators have been more widely adopted for the purpose of strengthening line management in its personnel handling function. Uncertainty about the precise gains possible and hostility to specialized counseling help explain management indifference. Management training in, and professionalization of, employee counseling are recommended. Experimentation with industry financed agencies having specialized counseling resources is suggested. 370 pages. \$4.75. Mic 57-831

THE LOCATIONAL ORIENTATION OF INDUSTRY TO MARKETS

(Publication No. 20,250)

Clifford Emil Larson, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor J. Howard Westing

The purpose of this thesis is to develop an analytical tool that will be useful for industry analyses and industrial site selection. The use of this tool is illustrated by applying it in the location factor analyses of nine manufacturing industries. The tool developed is the coefficient of market orientation. Its use in analysis is to measure the locational relationship of an industry with its markets.

In theoretical analyses, the relative importance of the market as a locational determinant can be measured for various industries and generalizations made concerning this factor. Its practical advantage arises from its value to industrial development agencies, seeking industry to locate in a specific region, by indicating which industries might be attracted to the area. Industrial firms considering relocating or expanding facilities can compute coefficients of market orientation to determine the locational trend of the industry. Present location theory is of limited practical value for solution of specific problems.

The coefficient of market orientation was developed after experimentation with state data from the Bureau of the Census. Coefficients were computed for 28 industries and their markets for the years 1929, 1939, 1947, and wherever possible, 1953.

These are years for which Census of Manufactures data are available and which are representative of recent economic periods. Industries were selected to represent

the manufacture of durable and nondurable goods for both industrial and consumer markets. From these industries for which coefficients of market were computed, nine industries were selected for further analysis to describe the factors affecting their locations and to illustrate how the coefficient of market orientation measures these locational relationships.

The simple coefficient of market orientation is represented by the formula $c = 1 - \frac{\sum (x-y)}{200}$ where x and y are

state percentages of U. S. totals for the statistical series representing the industry and the market respectively. The differences for each state (x-y) are totaled without regard for sign.

A coefficient approaching unity indicates that differences between the industry and its markets in the states are small and that there is close geographic association. A low coefficient indicates large differences and little geographic association between industry location and markets.

This correlation measure can be used with any state data that represent the industry and the location factor, such as value added, employment, income, or sales. The contribution of the coefficient of market orientation is that it measures the locational relationships of industry with its markets. It replaces generalization and speculation with a quantitative measure.

In the measurement of these relationships between industries and their markets, the coefficient of market orientation has both practical and theoretical applications. The practical advantage of this measure arises from its value to industrial development agencies seeking industry to locate in a specific region and to industrialists seeking locations for relocating plants or expanding production facilities. Its theoretical value comes from its possible use as a basis for distinguishing between types of industries according to measurable locational characteristics.

The coefficient of market orientations is a single mathematical abstraction that objectively measures the locational coincidence of an industry and its markets. It replaces subjective observation with an empirical measure of the relationship of industry with its most important location consideration - its markets. By the use of this coefficient in industrial analysis, contributions can be made to location theory, industrial development, and site selection.

226 pages. \$2.95. Mic 57-832

ECONOMICS, FINANCE

A COMPARATIVE STUDY OF INCOME TAX ADMINISTRATION: GREAT BRITAIN AND EGYPT

(Publication No. 20,221)

Adly Fahmy Abdel-Meguid, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor H. M. Groves

Tax administration has been the subject of considerable discussion, but very few works could be found dealing specifically with this topic. Efficient tax administration is

of vital importance to any revenue system because of its bearing on the yield of taxes, its relation to taxpayers' irritation, and its effect in terms of equity. Income tax administration is of particular importance because income taxes are occupying a major role in the revenue schemes of most countries, and in under-developed ones they are a very significant means to achieve a better distribution of incomes. Great Britain has had quite a long experience with income tax administration since the imposition of income taxes in 1798. Egypt on the other hand started income taxes in 1939 only. A comparison between the two countries might prove to be helpful to the Egyptian revenue system.

Available source material concerning the administration of the British tax (most of it in reports of parliamentary committees and government agencies) was reviewed thoroughly. The same approach was made with regard to the Egyptian problem but here available material is scarce and heavy reliance on certain United Nations reports was necessary. Considerable examination of some major sources plus several interviews concerning American administration was also undertaken particularly for the purpose of defining the distinctive features of the British practice. Special attention was given such areas of administration as: withholding, information at the source, auditing, appeal, penalties, public relations, and personnel management.

The extraordinary achievement of the British income tax administration has been due to:

- 1. Source collection: Collection at the source is heavily relied upon. This reduces the possibility of evasion and minimizes cost of collection.
- 2. Employees and discretion allowed: The high ratio of the number of employees to population as well as the discretion allowed to Inspectors results in saving money, time and effort for both the taxpayers and the taxing authority.
- 3. Decentralization: With less population, territory, and income the British have ten times as many offices as the American Federal Government. Decentralization in Great Britain far exceeds that of both the Egyptian and American revenue structures. The Egyptian law is substantively defective in its schedular differentiation of income. Outstanding weaknesses of administration are:
- 1. Poor recruiting and training methods as to personnel. No overall policy is planned by the Department of taxation so as to get the most from its personnel.
- 2. Unfortunate public relations, neglecting to develop a cooperative attitude. This may be attributed in part to the recent introduction of income taxes and the underdeveloped tax conscience; it is also due to neglect of taxpayers' education and niggardly direct assistance programs.
- 3. Overuse of arbitrary methods in lieu of administrative achievement. The reason behind the use of the arbitrary methods is to reduce the back log of tax cases. It is feared that such a trend will continue with the increase of the number of taxpayers unless the overall policy is revised and more efficient operation along with more adequate resources is provided.

Evasion to some degree is found in all income tax administration even in Great Britain; but the amount in

Egypt is undoubtedly excessive. In the latter country it is associated especially with the schedular income tax on commercial and industrial profits. In this area the law was adapted from French legislation where ambiguous, non-harmonious, and uncoordinated sections provide too many loopholes and afford too much opportunity for both evasion and avoidance.

Although countries such as Egypt have grave and special difficulties in income tax administration to overcome, some of these will yield to good leadership and experience; others can be met in part by adapting the law to special conditions. Still others will remain but may be tolerated on the ground that no tax is perfect and that the income tax has a special contribution to make to the revenue systems of such countries as Egypt.

225 pages. \$2.95. Mic 57-833

JAPAN'S BALANCE OF INTERNATIONAL PAYMENTS BETWEEN 1924 AND 1936

(Publication No. 20,245)

Hiroya Katayama, Ph.D.
The University of Wisconsin, 1957

Supervisor: Professor P. T. Ellsworth

This study deals with the disequilibrium in Japan's balance of international payments during the period 1924-1931 and the restoration of equilibrium in the years 1932-1936. This requires not only clarification of the balance of payments itself but also investigation into the relationship between the balance of payments and the level of domestic economic activity. Accordingly, this thesis has three major objectives: (1) a study of the detailed accounts of the movement of each item in the balance of payments; (2) an examination of the adjustment mechanism for restoring and maintaining both internal and external balance; and (3) a quantitative study of commodity trade. For both theoretical and practical reasons, the whole period is divided into three parts: 1924-1929, 1930-1931 and 1932-1936.

In dealing with the first objective stated above, special emphasis is placed on the long-run disequilibrium in commodity trade, and on the effect of the depreciation of the yen upon each item in the balance of payments. In the first two periods, 1924-1929 and 1930-1931, the most important cause of balance of payments deficits was the cost-price disorder in the Japanese economy. Japan's balance of payments during these periods was further aggravated by exchange rate fluctuations which gave rise to exchange speculation. In the last period, 1932-1936, on the other hand, successful adjustments in relative prices and the development of cotton textile and other manufactured commodities as major export items enabled Japan to remove the structural disequilibrium caused by the decline of raw silk exports.

The depreciation of the yen after 1932 had quite favorable effects, on the whole, not only on commodity trade but also on other important items such as shipping services and immigrants' remittances. Yet it tended to worsen the balance of some other items such as interest payments.

The commodity trade is further analysed in quantitative

terms in order to establish the basic relationships between the volume of imports and exports, prices and income. Multiple correlation analysis is used in this investigation. It is shown that changes in import and export volumes are largely explained by fluctuations in prices and income, and that the depreciation of the yen was effective in restoring the commodity balance of trade.

The second objective, which is the center of this work, is essentially concerned with the policies adopted by the Japanese Government in order to restore and maintain both internal and external balance. It is argued that an adequate government policy should have followed two main lines in achieving this goal: (1) financial policies for the purpose of maintaining internal balance and price adjustments for the purpose of restoring external balance, or (2) financial policies for the purpose of bringing external balance and price adjustments for internal balance. The three periods are critically examined according to this principle.

In the first two periods the combination of policies pursued by the Government was wrong. Specifically, there was no consistent policy of price adjustments; large deficits in the balance of payments remained throughout the periods. It was during the years 1932-1936 that the Government adopted a combination of policies which was in conformity with the criteria used in this study. The Government pursued a policy of depreciating the yen in the interest of external balance and a financial policy of inflation in the interest of internal balance. Exports showed a remarkable advance and the balance of payments improved very substantially. The domestic economy quickly recovered from the great depression of 1930-1931.

302 pages. \$3.90. Mic 57-834

THE DEVELOPMENT OF COMPREHENSIVE INSURANCE FOR THE HOUSEHOLD: A PROCESS OF INTEGRATION (PARTS I-III)

(Publication No. 17,262)

John Eugene Pierce, Ph.D. University of Pennsylvania, 1956

Supervisor: Dr. Harry J. Loman

The recent development in the United States of comprehensive policies of the type designed to provide in a single contract all of the different kinds of property and liability insurance needed by the dwelling owner marks both the culmination of a lengthy series of steps and the starting point of a new stage in the history of propertycasualty insurance. This investigation deals with the integrative process by which such policies have been formed and has as its major purpose the derivation of principles which may indicate the optimum breadth and flexibility of policies applicable to the circumstances of different households. These principles are based upon detailed analysis of the background and development of the Personal Property Floater Policy, the Comprehensive Personal Liability Policy, the Combination Automobile Policy, and the fire insurance policy with comprehensive dwelling forms, as well as the confluence of coverages from these

broad policies to form the Homeowners Policies, the Comprehensive Dwelling Policy, and other such contracts. Influences tending toward the growth and acceptance of comprehensive insurance, the techniques by which integration is accomplished, and some of the problems which accompany this process are also considered.

Comprehensive insurance appears as the result of a gradual process of integration characterized by the broadening of insuring clauses, omission of exclusions, and combination of previously separate coverages to form policies of growing scope, completeness, and cohesiveness. Recognition is given to the principle that a contract of insurance which deals with a comparatively small area may more readily be made liberal as to that area than may one of greater scope. Hence, primary emphasis is given to expansion of coverage, as distinct from mere liberalization of terms. It is also recognized that there is an inherent conflict, in practice, between comprehensiveness of coverage and the inseparability of components which militates against the widespread standardization of any very inclusive policy which does not make adequate provision for differences among types of risks. An attempt is made to reconcile this conflict by consideration of the means for obtaining proper flexibility without resorting to the mere fitting together of fragmentary units.

The historical facts contained in the study are carefully selected with a view to its special purpose. As to any given period of development, for example, only the few policies which are most inclusive are analyzed. An attempt is made to reveal, by the surveying of actual instances of integration, the typical patterns by which, in each period, policies more inclusive than the broadest of their predecessors are made available.

571 pages. \$7.25. Mic 57-835

A STUDY OF THE COUNTER-CYCLICAL ASPECTS OF TOTAL GOVERNMENT FISCAL POLICY, 1929-1940

(Publication No. 18,746)

Ansel Miree Sharp, Ph.D. Louisiana State University, 1956

Supervisor: Professor William D. Ross

The task of this Study is to determine the feasibility of coordinating state and local fiscal policy with federal fiscal policy in order to stabilize employment at high levels without inflation. The method used is the income approach - the study of government fiscal policy in terms of income and employment, and the period selected for study is 1929-1940.

There are serious limitations to a coordinated federal, state, and local fiscal program for economic stabilization. These limitations are: (1) the bias of state and local tax structures in favor of taxing consumption, and the inflexibility of state and local tax structures; (2) legal, institutional and market difficulties experienced by state and local governments in obtaining credit; (3) the inability of state and local governments to stabilize capital expenditures; (4) the overall failure of total government net spending to be properly timed, coordinated, and of a sufficient magnitude to replace the deficiency in private spending.

A long-run vision will envisage progress in overcoming many of the difficulties of state and local governments; however, the immediate emphasis of this Study is on the encouraging findings that would seem to verify the feasibility of a coordinated fiscal program. These encouraging factors are: (1) Social and economic conditions fostered a higher level of federal-state spending, reflecting a growing sense of responsibility for economic stabilization. (2) State-local tax and spending structures have become more centralized, with state taxes and spending a larger ratio of the total. States are in a better position to pursue a counter-cyclical fiscal policy than local governments. States have more and better administered tax sources, better borrowing facilities, and a more flexible, dispersed spending program than local governments. (3) Federal grants and federal loans to state and local governments offer a means by which federal, state, and local fiscal policy can be coordinated. During depressionary times, federal grants may be increased. During inflationary periods, federal grants may be decreased. Federal agencies could buy state and local issues when private credit is unavailable, or when available only at abnormally high prices, and sell them when the market for them has improved. (4) State aid to local governments offers a way by which state-local fiscal policy may be coordinated. When local units decrease spending as a result of loss of revenues during a depression, state aid could be increased; during inflationary periods, state aid could be decreased. State aid could be in the form of buying or guaranteeing the sale of local securities as well as direct grants and shared receipts. (5) States play a greater role in economic stabilization than is usually realized. State spending increased throughout the period, and increased at faster rates than state taxes until 1935. The net effect of state fiscal policy was to add to the income flow in every fiscal year except 1937. (6) Government net spending was counter-cyclical in its effect in many instances. Government net spending was income-maintaining during the 1929-1933 contraction and net spending probably played an important role in the recovery of economic forces.

The logic of an ideal counter-cyclical fiscal policy may imply that economic security is desirable at all costs - even to the giving up of present economic institutions. This need not be the case. Instead, realistically viewed, a coordinated fiscal policy for economic stabilization may be an alternative to a socialized economic system. Actually, a coordinated fiscal program at the federal, state, and local levels is desirable and feasible without basically altering fiscal structures and fiscal responsibilities.

342 pages. \$4.40. Mic 57-836

ECONOMICS, HISTORY

A HISTORY OF THE PRODUCTION AND MARKETING OF RICE IN CALIFORNIA

(Publication No. 17,893)

Norris Arthur Bleyhl, Ph.D. University of Minnesota, 1955

California, which has successfully grown rice only since 1912, produces about a fifth of the American crop. Her climate being too cool for the long-grain rice grown in Louisiana, Texas, and Arkansas, California's production, except for a little medium-grain, is overwhelmingly short-grain. The domestic consumer's preference for the long-grain for table use forces California rice into offshore markets, such as Puerto Rico, Hawaii, and Japan, except for that used in the making of breakfast cereals and beer. Climate also decrees that neither the experience of the South Atlantic States, which produced most American rice until the Civil War, nor the experience of the modern Gulf Coast industry is particularly applicable in California. Moreover, the misunderstanding of climatic conditions led to the failure of all nineteenth century California rice experimentation.

Beginning in 1908 a series of tests conducted jointly by the Federal Government and interested Sacramento Valley farmers led to the establishment of the industry; whereupon owners of land previously considered almost worthless began to prosper. Rice growing then spread throughout several Sacramento Valley counties and into the San Joaquin Valley, which produces about 15 per cent of the rice of the state, the limiting factor in that valley being a scarcity of water. Almost all of the remainder grows in the Sacramento Valley, though small amounts are raised in the Imperial Valley.

In 1920 the collapse of the World War I boom and inclement weather at harvest time bankrupted many growers. Those who were strong enough to continue then slowly completed mechanization of their industry, substituting the airplane for the grain drill and the combine-drier for the thresher, in which developments they led the southern industry. They also solved or mitigated staggering drainage, weed control, and bird infestation problems, secured adequate tariff protection, fought for equitable freight rates, secured government credit to further their orderly marketing program, sought dependable foreign markets, and cooperated with the New Deal agricultural programs. These programs were moderately helpful to rice planters. Besides, the Federal and State Governments aided significantly by sharing with growers the financing of research carried on by the Rice Field Station, and by supporting authoritative rice inspection and market news services.

Japanese were among the pioneer California planters, and for the first several years they and Hindus produced a third of California's rice. However, their unfamiliarity with machinery, the attractions of truck gardening or city life, and the unfriendly alien land laws eventually drove most non-Caucasians out of the industry.

Almost from the beginning growers mistrusted millers, their partly justified mistrust leading to formation of the Pacific Rice Growers' Association in 1915. When this cooperative failed in 1921 it was immediately replaced by the Rice Growers Association of California, a well-financed group with strong leadership. The Association

became a milling cooperative in 1929, again because of partly justified mistrust of millers. Today two smaller milling cooperatives share the field with the Association and the remaining private mills, but the Association is decidedly the largest miller in California; the three cooperatives together mill about 70 per cent of the state's rice.

Millers' associations, in which the cooperatives hold membership, before World War II violated the anti-trust laws by conspiring to fix prices on rice sold in American markets. Since then these associations have fixed prices only on rice sold in foreign markets, a legal activity under American law.

During most years except 1920 and the early thirties California rice growers have prospered, and both world wars brought rice booms; that following World War II was still in existence during 1954.

547 pages. \$6.95. Mic 57-837

THE PANIC OF 1819: CONTEMPORARY OPINION AND POLICY

(Publication No. 20,064)

Murray Newton Rothbard, Ph.D. Columbia University, 1956

The Panic of 1819 was America's first great economic depression. This study investigates the search for remedies propelled by this new and puzzling disturbance to an economy first beginning to emerge from an underdeveloped stage. The work discusses the remedies that were proposed and the resulting controversies and policies. Proving valuable sources were the newspapers of the period, as well as legislative journals, monographs, memoirs, etc.

The reasoning in these debates was on a highly sophisticated level. The disputants showed full familiarity with the European economic literature, and were able to make original contributions in their study of American conditions. In fact, the Panic served as an impetus toward the development of a body of systematic economic thought in America during the 1820's. Also foreshadowed were many modern theories and plans, e.g.: the relation between the interest rate and the profit rate, the problem of changes in the purchasing power of the dollar, the subjective theory of value, the Austrian theory of over-spending, pumppriming, the stress on velocity of circulation, theory of hoarding and dishoarding, full-employment policy, fiscal policy--reducing taxes on consumption to stimulate spending, "hot money" analysis of specie flows, a Federal Reserve System, etc. The Currency Principle emerged in this discussion before its introduction to the English scene, and anticipated the later hard-money slogans of the Jacksonian movement.

Arguments centered on proposals for monetary expansion, direct measures for debtors' relief--such as stay laws to postpone executions on judgments for debt, and minimum appraisal laws to prevent the debtors' property from being sacrificed below a set price, and the protective tariff. Proponents of these measures all promised relief from the depression. Stay and minimum appraisal laws would help debtors and bolster business activity, while monetary expansion would lower interest rates, supply

credit, and raise prices. The tariff would relieve manufactures, cure unemployment, and supply a home market for agriculture.

The opponents of the various measures asserted that they would only aggravate the depression. The critics of debtors' relief asserted that creditors would lose confidence, and opponents warned that paper money would depreciate. Free traders charged that the tariff would worsen the existing commercial depression, and place tax burdens on consumption.

Critics of all legislative relief generally relied on individual "industry" and economy as the only lasting cure for depressions. Some also rested their case on general laissez-faire philosophy.

The legislative struggles over money and debt were largely waged at the state level, as prevailing constitutional theory focussed responsibility for banking and debt on the states. Several Western states enacted, over bitter opposition, a program of state inconvertible paper, not directly legal tender but expected to perform the functions of money. Rapid depreciation, caused by inflation and adverse judicial decisions on their constitutionality, led to repeal of these measures and eventual return to specie payment.

On the Federal level, there were quite a few ambitious proposals for national inconvertible paper, and contrasting plans for elimination of paper and complete return to specie. No fundamental reform aroused much interest in Congress, however. The depression years also saw the rise of an enthusiastic protectionist movement eager to protect such newly-emerging manufactures as cotton and woolen textiles, glass, and iron. The proposed protective tariff of 1820 passed the House, and failed in the Senate by only one vote.

While the tariff struggle was waged on geographical lines, the conventional view that debtors' relief and paper money conflicts were fought on geographical, occupational, and income-class lines is strongly contradicted. The controversy cut sharply across all these lines. Western legislation was closely fought, and conflicts raged in many Eastern states. Wealthy and respectable men were the leaders on both sides.

423 pages. \$5.40. Mic 57-838

ECONOMICS, THEORY

APPLICATION OF ACTIVITY ANALYSIS TO THE THEORY OF GENERAL EQUILIBRIUM

(Publication No. 20,135)

Lionel W. McKenzie, Ph.D. Princeton University, 1956

The application of activity analysis is made to three sorts of questions, the question of achieving efficiency in production, the question of the existence of a competitive equilibrium, and the question of factor price equality, that is, of the uniqueness of factor prices given goods prices. Again two issues are discussed in connection with efficiency, the attainment of ideal output in face of monopoly and indirect taxes, and the pattern of specialization in world trade.

In regard to ideal output, the criterion of equal degrees of monopoly in all industries is refuted. An analysis based on degrees of inflation of actual prices over competitive prices is developed. The competitive prices are defined by setting competitive prices of factors equal to their market prices and computing prices for goods with the taxes and monopoly profits omitted. It is shown that even equal degrees of inflation does not imply efficient production.

The patterns of specialization in world trade are discussed in terms of the Graham model. It is proved that all efficient specializations can be characterized in terms of efficient complete specializations. The analysis is extended to smooth, but not necessarily linear, production possibility loci for the trading countries by using marginal races of substitution to define the comparative advantages. It is then shown that the introduction of trade in intermediate products renders the Graham model inapplicable, though linear activity analysis can still be used.

In the discussion of the existence of equilibrium, first the existence and uniqueness of equilibrium in the Graham model of world trade is demonstrated. Then the existence of an equilibrium is proved for a more general model in which the continuity of demand is derived from more basic assumptions. Also dependence of consumer preferences on market events is allowed, and the production model is fully general. The essential requirement is that every consumer enjoy a positive income near a possible equilibrium point.

Two types of theorems are proved on factor price equality in world trade. It is shown that, assuming homogeneous production functions, equal factor prices for given goods prices are necessary if they are possible without specialization to fewer independent processes than the number of factors present. By "possible" is meant compatible with factor supplies and the profit conditions of competitive equilibrium. A second type of theorem is exemplified by a result that depends on the same process being in use. Suppose that whenever a number of processes are used together at one set of prices the factor space which they span intersects the interior of the factor space spanned by them when used together at any different set of prices. Then the equality of goods prices, and the use of these processes by two countries in common, implies the same factor prices for these countries. This theorem may be applied to any set of processes and the factors used in them without reference to other processes 192 pages. \$2.50. Mic 57-839 and factors.

MARKET ORGANIZATION AND COMPETITION IN THE PERISHABLE PRODUCTS BAKING INDUSTRY

(Publication No. 19,042)

Charles Clifford Slater, Ph.D. Northwestern University, 1956

This industry fits neither of the two polar limits of pure competition or monopoly to which economic theory offers a simple and unequivocal explanation. Thus, for an answer as to how and how well the industry performs to satisfy consumers with the resources allocated to it, we must look to the circumstances and functioning of the industry.

ECONOMICS 527

This study examined first the basic economic conditions of demand and supply. This entailed an examination of consumption patterns and consumer shopping habits as well as a review of the available data on elasticity of demand. The conditions of supply were reviewed in an extensive analysis of labor relations as well as the more traditional examination of material supply markets.

Attention shifted then to the organization of the industry as it has evolved to equate demand and supply conditions. The distinct segmentation of baking was analyzed. While these segments represent primarily distribution differences, there are important product differences among them. Interest in this study centered on the five industrial segments rather than on the more numerous but small single-unit retail bake shops. Three of the segments employ commission-paid driver-salesmen to deliver their products: the wholesale-to-grocer segment, the institutional or restaurant bakeries, and the house-to-house bakeries. Two segments do not employ driver salesmen: the chain-store bakery segment and the multi-outlet-retail bakery segment. Largely as a result of the distributive differences, the chain store bakeries are able to hold their prices substantially below the wholesale bakeries. This distributive organization was related to the perishability, fragility, and high bulk to value ratio which has forced the industry into a pattern of local metropolitan markets, with representation from each of the segments in most large markets.

Because there are important economies for large scale plants, there are in each market only a few sellers, although there are important combines of plants operating in several markets, both horizontally integrated corporations and cooperative alliances that span several markets.

With this detailed background of both the basic economic conditions and the resultant organization of the baking industry, the character and quality of competition was assayed. The price structure was analyzed to determine whether competitive forces such as ease of entry, substitution effects or external competitive factors were effective in minimizing cost-price spreads. Ease of entry into certain segments and the ease of substituting home baked products or the products of non-industrial retail bake shops together with chain food organizations' over-all price policies seem to prevent excessive prices, because they sell bread which is a low priced alternative to the wholesalers' brands. The character of intra-segment competition, including feasible non-price competitive tactics, was analyzed along with patterns of rivalry among segments and among markets.

The responses to short term cost and demand changes were also analyzed, taking into account the frequency of change, the amplitude of factor price movements and the predictability of the changes. The low unit price of most bakery products inhibits price adjustments to minor cost changes; hence, the non-price reactions were explored also.

Attention was given to recent changes in the basic conditions of demand, i.e., shopper preference for large food stores, and supply, i.e., the technical developments which foster intense rivalry between sellers formerly in separate markets. These factors are apparently leading to a reorganization of the distributive methods for serving grocery stores with bakery products. These changes in competition are likely to mean an overall reduction in the number of sellers, but new techniques of competition to-

gether with intensified inter-market rivalry are emerging. Thus, competition appears to be headed for changes in form, but the workability of competition as a means of allocating resources may well be improved.

555 pages. \$7.05. Mic 57-840

SAINT THOMAS AQUINAS AND THE MODERN THEORY OF ECONOMIC WELFARE

(Publication No. 19,887)

Stephen Theodore Worland, Ph.D. University of Illinois, 1956

The objectives of this study are to show: (I) whether the normative premises used in welfare economics agree with those which Saint Thomas considers appropriate for the discipline of economics; and (II) whether Saint Thomas and welfare economics agree that the economist, <u>qua</u> economist, should derive his conclusions from premises which he takes as given.

Analysis of Saint Thomas' social philosophy indicates that he would consider economics to be: (I) a "practical science"--a normative science concerned with showing what economic policies are desirable; and (II) a "subordinate science"--a discipline which uses as premises propositions established by a more abstract discipline. Furthermore, according to Thomistic ethics, the basic normative premise of economic science would be the proposition that "wealth is a good;" from this proposition, Saint Thomas himself draws the conclusion that "prices ought to be just."

The general value judgment implicit in welfare economics is the "preference principle" -- i.e. the assumption that "people ought to get what they want." To show whether or not welfare economics uses normative premises similar to those which Saint Thomas considers appropriate for economics, it must be shown whether or not the preference principle, as used in modern welfare economics, can be considered a corollary of the basic assumption-implicit in utilitarian welfare economics--that "wealth is a good." Our conclusion is that it cannot be considered such a corollary. Economists, along with spokesmen for other branches of social science, tend to use ethical norms currently prevailing in their society as their normative premises. This method of selecting value premises leads to the assumption that "people ought to get what they want." Consequently, the preference principle, as used in welfare economics, cannot be considered a corollary of the assumption that "wealth is a good." Thus, there is wide divergence between Saint Thomas and modern welfare economics with respect to the normative premises of economics.

With respect to the second objective of this study, there is wide divergence between Saint Thomas and modern welfare economics also. They both agree that the economist, qua economist, must take his normative premises as given. But the Thomistic position is that such premises must be established by a discipline other than economics; the position of welfare economics is that such premises are incapable of scientific demonstration.

233 pages. \$3.05. Mic 57-841

EDUCATION

EDUCATION, GENERAL

THE DEVELOPMENT OF A WORKBOOK FOR CLASSROOM INSTRUCTION IN DRIVER EDUCATION (PARTS I AND II)

(Publication No. 17,635)

Frank Bennett, Ed.D. New York University, 1956

The Problem

The problem is the development of a workbook for classroom instruction in driver education for secondary schools.

Importance of the Study

There are relatively few workbooks in the field of driver education. Those that have been produced are either limited in function, poorly organized, or may be used only with a particular textbook. A driver education workbook, having instructional materials and methods selected for their capability in improving knowledges, understandings, skills, and attitudes of all adolescent drivers, is a teaching aid that is needed by teachers in this field.

Procedure

To determine the items of content and a basis for the organization of a general workbook, a checklist was developed and utilized to review and analyze 43 selected workbooks.

To determine the leading contributing factors and circumstances in highway accidents involving fatilities, it was necessary for the investigator to review and analyze the accident facts for a five-year period, and also to visit representatives of leading national, state and local organizations that collect and analyze highway accident information.

To determine the leading general areas of instruction in driver education and their order of importance, the investigator reviewed and analyzed the literature in this field, including 15 selected courses of study in driver education. From this information an evaluation form was developed and sent to a 15-man jury of traffic safety experts for appraisal. The same evaluation form was utilized to indicate the best subject area placement of the leading contributing factors of highway accidents.

To determine the instructional materials and methods to be introduced in the workbook on driver education, the investigator reviewed and analyzed the same literature and the selected courses of study in driver education. Major and minor key knowledges which contribute to the understanding of the general learning areas were selected. The many and varied teaching methods and technics were reduced to 14 key instructional methods. An evaluation form was prepared and sent to the same 15-man jury of traffic safety experts for appraisal.

To prepare a workbook for classroom instruction in driver education, the investigator developed teaching-

learning experiences for each of the 14 leading general learning areas and organized them into the desired workbook pattern.

Results

Analysis of the 43 workbooks revealed the items of content and a basis for the organization of a general workbook.

A study and analysis of highway accident facts and the visits with the representatives of the leading safety organizations revealed the leading contributing factors and circumstances in highway accidents.

The results of the tabulation of the 15 evaluation forms returned, formed the basis for the determination of the leading general learning areas, their order of importance, and also the best subject area placements for teaching the leading contributing factors and circumstances in highway accidents.

The results of the tabulation of another part of the evaluation forms returned, formed the basis for the selection of the major and minor key knowledges and the key instructional methods.

Part II of the study consists of selected, validated instructional materials and methods and other workbook items of content in each of the 14 leading general learning areas arranged in a logical order with space assigned commensurate with its order of importance as judged by the jury, although other evidence of value was considered in the development of the framework and the content of the workbook.

404 pages. \$5.15. Mic 57-842

LEGAL ISSUES PERTAINING TO THE REGULATION OF PUPIL CONTROL INTERPRETED IN LIGHT OF CERTAIN SOCIAL CHANGES, 1828 to 1900

(Publication No. 19,615)

Edward Richard Butler, Ph.D. University of Pittsburgh, 1956

The purpose of this study was to identify the legal issues in rules and regulations of boards of education for the control of the public school pupil, and to interpret them in light of certain social changes. The documentary-analysis method, a type of historical research, was employed throughout the study. Cases were taken from the American Digest System, key numbers 169 to 172 1/2 and supplemented by Corpus Juris Secundum. Factors causing social change were determined from sociological and educational source books.

The story of the evolution of the American public school system has been one of broad interpretation of implied powers on the part of the local school authorities in most states. Many school districts have experimented with rules and regulations of various types to control the

actions of public school pupils. Some of the rules have been of such restrictive nature that the parents have protested by taking the matter to the courts for settlement. The court interpretations of the legal issues involved have served as the bases for future legislative enactments, and as a guide to aid local school directors in the establishment of necessary rules and regulations for the efficient operation of schools under their control.

The United States has passed through several stages of growth since it broke away from European rule. The early formative years were basically a continuation of rule by leaders of the aristocratic class. Andrew Jackson's election to the presidency in 1828 marked the trend of leadership toward the common man Many other factors brought about social change during the period covered by this study.

Court decisions have established that certain rights must be granted to the pupils and that certain rights belong to the board of school directors. The courts have been very careful to insure that the rights of each group be protected.

Boards of education have certain powers delegated to them by state legislative bodies to make necessary rules and regulations for the operation and management of the local school district. A pupil must comply with all reasonable rules or the severe penalty of exclusion may be exercised. Pupils may be excluded for acts of misconduct, gross immorality, excessive absence, or refusal to follow direct orders. The board of education may prescribe what courses are to be a part of the curriculum. Any pupil who refuses to read from the prescribed reading material may be excluded by board action. Failure to prepare written compositions required by the teacher may also serve as a basis for expulsion.

The board of education may act as a judicial body in conducting an examination prior to excluding a pupil from the classroom. This hearing is essential before the pupil may be excluded. All board action is subject to review by the courts.

American education has both influenced and been influenced by social change. There are certain forces at work in the environment that tend to bring about social change. The respect for the rights of the individual, a desire for the acquisition of knowledge, and an appreciation of the democratic process developed during this period. The recognition of the need for rules to accomplish the objects of democracy, the rapid urbanization, and the rise of the common man were other contributing factors noted. Social change influences the attitude of those living at the time the change occurs, and has a lasting influence on the cultural patterns of the future.

Certain aspects of social change have influenced the judges in rendering decisions on the issues called to their attention. 145 pages. \$2.00. Mic 57-843

PROPOSED MUSIC OFFERINGS FOR THE ELEMENTARY CURRICULUM BASED ON THE MUSIC EXPERIENCE AND KNOWLEDGE OF FRESHMEN AND GRADUATES, PENNSYLVANIA STATE TEACHERS COLLEGES

(Publication No. 19,337)

Henry Reutschlin Casselberry, Ed.D. The Pennsylvania State University, 1956

The Purpose of the Study was

to ascertain the music experiences and opportunities which high school graduates entering the elementary curriculum of seven State Teachers Colleges in Pennsylvania had had in their elementary and secondary school music classes and in private study of music throughout the same period:

to ascertain the amount of music knowledge and elementary music theory which these high school graduates had retained from elementary and secondary school and from private study;

to determine the extent to which the study of one or more musical instruments contributes to the attainment of music knowledge;

to ascertain the extent to which musical experiences in and out of school contribute to musical knowledge;

to survey the musical environment of these high school graduates in home, school, and community;

to ascertain if high school graduates who enter the elementary curriculums in Pennsylvania State Teachers Colleges should have additional music offerings at the college level, and if so, to suggest specific offerings based on the findings of the check list and questionnaire.

A survey was made of the elementary curriculums of the State Teachers Colleges in Pennsylvania.

Check lists were administered to 455 freshmen in the elementary curriculums of seven Pennsylvania State Teachers Colleges.

A survey was made of two hundred recently graduated elementary curriculum teachers, to obtain pertinent data regarding their music preparation and needs for teaching music in the elementary schools.

There is a definite correlation between the amount of school music experiences and the test on music knowledge.

Students who had had instrumental training before entering college tend to possess greater music knowledge than those without prior training.

The length of previous training on a musical instrument appears to have some bearing on the amount of music knowledge.

There is need for more adequate guidance of high school pupils who plan to become elementary classroom teachers.

Teachers who were graduated in the elementary curriculums of the State Teachers Colleges expressed a need for additional offerings in piano instruction which included accompaniment techniques, vocal techniques, rhythm band experiences, creative song techniques, dramatizations, dances and operetta techniques, and instruction on accompaniment instruments.

Analysis showed that only four per cent of teachers with less than two and one-half years of piano training could play accompaniments to elementary school songs which they were required to teach.

All elementary curriculum college students should be required to demonstrate proficiency in piano by playing accompaniments to songs which are taught in the elementary schools. Those who cannot should be required to secure this development at the college level.

More time should be allotted to vocal instruction for the prospective teacher of elementary children.

More experience in creative song techniques should be provided within the college music offerings.

Instruction in the use of accompaniment instruments other than the piano should be available to the prospective teachers.

A large percentage of inservice teachers indicated a need for additional experience in rhythm band techniques.

A greater stress should be placed on the learning of fundamentals of music. Entering freshmen exhibited considerable weakness in this portion of the music knowledge test in the check list.

The music curriculum in college should provide some opportunity for prospective elementary teachers to become acquainted with the techniques of teaching class piano at the elementary school level.

VITA

Henry Casselberry was born in Philadelphia, December 29, 1900. He obtained his elementary and secondary education in the public schools of Philadelphia. In 1936 he received the B.S. degree from Temple University and in 1938 the Master of Science degree. The Doctor of Education degree was conferred at The Pennsylvania State University in 1956.

131 pages. \$2.00. Mic 57-844

SOME FACTORS INFLUENCING PUBLIC OPINION ON FREE SCHOOLS IN PENNSYLVANIA, 1800-1835

(Publication No. 18,094)

John A. Dwyer, Ed.D. Temple University, 1956

The purpose of this study was to describe the attempts made to establish free schools in Pennsylvania during the years indicated, and the attempts made to block or postpone such establishment. It became apparent, while investigating some source material of the period, that the public opinion which permitted the free school act to be passed in 1834 and to be maintained against great odds in 1835, was formed during the preceding thirty-five years. Most secondary materials emphasize the 1834-1835 biennium when discussing Pennsylvania's educational development, and neglect the fruitful, formative years which went before.

The work of the legislative and executive branches of the state government was inspected for the entire period in an attempt to discover the extent to which elected state officials influenced the development of elementary schools in Pennsylvania. Private organizations and societies flourished also, and their efforts and significant accomplishments were investigated. Organizations such as the Pennsylvania Society for the Promotion of Public Economy, the various Infant School and Manual Labor School associations, The Pennsylvania Society for the Promotion of

Public Schools, and the Controllers of the Philadelphia Public Schools, had a more or less direct effect on the state government and hence on educational legislation during the period.

Pennsylvania's march toward free schools was hampered by the presence of many formidable obstacles. The economic situation was seldom conducive to progressive educational legislation. The Germans, with their insistence on the use of their native tongue, constituted a unique and stubborn barrier. And the teachers themselves were to blame for no small amount of the educational lethargy of the day.

Other institutions which were at times uncooperative and antagonistic toward free schools were the State Legislature, and several of the religious denominations which had their own church schools. Public indifference, the Pennsylvania Constitution of 1790, and the lack of an administrative system which could act as a framework for progressive research and legislation also contributed to much of the educational inertia of the day. The effects of each of these was investigated.

The method used throughout the study was the historical, and the factors which influenced the development of free schools in the state were each subjected to a detailed analysis wherever possible.

It is hoped that one result of the study will be a shift of emphasis, when considering Pennsylvania's early educational development, from the years 1834-1835 to the entire first thirty-five years of the nineteenth century.

321 pages. \$4.15. Mic 57-845

COMPATIBILITY OF THE CULTURAL HERITAGE AND EDUCATION IN IRAQ

(Publication No. 19,657)

Adeeb F. Fargo, Ph.D. University of Maryland, 1956

Supervisor: Dr. John J. Kurtz

This study concerns itself with a limited appraisal of education in Iraq. Iraq is politically a new country established after the first World War. Its culture, however, traces back to ancient civilization. Two special local conditions prompted the investigation (1) Iraq has recently undergone rapid cultural change, and (2) the present educational system is primarily a foreign importation. It is the purpose of the study, therefore, to discover the compatibility or incompatibility of present Iraqi education with the cultural heritage of the country and its people.

Development of the study, in the main, is based on documentary research. Three major tasks are considered essential to carrying out the stated purpose:

- 1. An exploration of the cultural heritage and the place of the individual in the social organization.
- 2. An evaluative description of current educational conditions and practices.
- 3. An analysis of the appropriateness of existing education in the light of the cultural heritage and existing social conditions.

In the study considerable inadequacies in the existing system of education were found. Ideals and values

concerning the human being implicit in the cultural heritage and the stated objectives of education were found to be highly compatible. However, in practice education apparently ignors both cultural heritage and social reality.

The social values from the Islamic heritage which gradually disappeared through later periods of Islamic history, have continued to be relatively ignored in the prevailing system of education. Moreover, both the content of the curriculum and the methods of the schools reflect the cultural patterns of Iraq that have developed under highly centralized forms of government that occupied the country for many generations. The educational process takes its cues, neither from the physical, emotional, cultural, and material needs of the people, nor from the values toward which the members of the local society continue to cherish a strong attachment. Instead the focus of concern seems to be acquiring theoretical knowledge.

The basic recommendation of the study concerns the reorientation of education so that practice may be in conformity with stated purpose and in tune with the cultural heritage. It is felt that if Iraq is to emphasize social values, it cannot hope to continue to confine the modes of life and thought of her people within a static framework of fixed rules and doctrines. The author feels that it is in the area implimenting a value orientation recognizing the dignity and worth of the individual that cultural heritage and education may be brought into harmony.

314 pages. \$4.05. Mic 57-846

PROBLEMS AND ADJUSTMENTS CAUSED BY HAVING STUDENT TEACHERS IN PUBLIC ELEMENTARY SCHOOLS

(Publication No. 19,744)

Lora Miller Frazee, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Harold Drummond

This study was undertaken to gain insight into adjustments made by and problems presented to public elementary schools at both administrative and classroom levels when student teachers are added to the personnel of the school.

Questionnaires, for the principal and two teachers, containing check type and free-response questions were sent to the 175 public schools having elementary grades and receiving student teachers from the State University of New York Teachers College, Oswego. An additional brief questionnaire was sent to students completing their final student teaching assignment. Although the study was limited to public elementary schools having student teachers from Oswego, it was not limited to that college's student teachers.

Problems identified by principals pertained to guidance and planning, subject matter competency, personality and faculty relations, orientation of student teachers, time adjustments, community relations, adjustments of cooperating teachers, liaison between public school and college and assignment of student teachers, classroom management, adjustment of pupils, discipline, increased load of public school personnel, sense of responsibility for student

teachers, strength of student teachers, and loss of student teachers. A few problems were classed as unique or special.

Problems identified by teachers pertained to guidance and planning, personality and faculty relations, community relations, adjustment of student teachers, time allotment, health of student teacher, adjustment of cooperating teachers, liaison between public school and college, class-room management, discipline, mechanics of procedure, understanding children, and post student teaching.

Problems were analyzed on the bases of selected community and school factors and were found, generally, to be unrelated to them.

The conference type of solution was used most frequently by both principals and teachers to solve problems presented by the presence of student teachers.

Both teachers and principals reported outstandingly favorable reactions to student teachers by pupils. According to principals, the comparatively few unfavorable reactions attributed to pupils were that children exhibited less desirable work habits. According to teachers, pupils reacted with less desirable conduct when student teachers were present.

Teachers were about evenly divided between favorable and unfavorable inclinations toward student teachers before having them, and decidedly favorable toward student teachers after working with them.

Both principals and teachers indicated that most problems of coordination with the college were solved through conferences. Neither mentioned, to any great extent, aid by the college in the mutual solving of student teaching problems, although members of both groups expressed appreciation for help given by the college.

Each group indicated a desire for additional help from the college, and in each case the types of aid requested were numerous. The number of persons requesting any one type of assistance was small. The lack of agreement concerning the additional services which the college could render indicates that, on the whole, the college is providing adequate aid to the cooperating schools but could individualize its services to a greater extent both to schools and to individual cooperating teachers.

As the problems given appear to be relatively unrelated to the factors selected as bases for analysis, it is possible that such problems exist in and of themselves and may, therefore, be expected to occur in any situation in which there are student teachers in public elementary schools.

There seems to be need for better understanding, closer cooperation, and more effective coordination between public school and college in solving these problems.

491 pages. \$6.25. Mic 57-847

A STUDY OF SIX HUNDRED STUDENT AUTOBIOGRAPHIES (VOLUMES ONE AND TWO)

(Publication No. 19,746)

Seymour Harrison Hurt, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Louis E. Armstrong

The purpose of this study is to determine the differences in autobiographical statements about six selected topics made by three groups of entering freshmen who later had varying success in academic achievement in college. The three groups of students are:

Group I, the ten entering freshmen who became the highest ten students in academic standing in each of the graduating classes of 1935 through 1954—a total of two

hundred students.

Group II, the ten entering freshmen who became the lowest ten students in academic standing in each of the graduating classes of 1935 through 1954—a total of two hundred students.

Group III, the first ten students who withdrew and who did not transfer to another institution, from each of the freshman classes of 1931 through 1950—a total of two hundred students.

The specific objectives of the study are embodied in seven hypotheses which deal with relationships between the groups of students and statements in their autobiographies regarding the home, the school, the church, ambitions, human relations, and leadership.

Conclusions

The conclusions of the study are founded in the testing of the hypotheses:

1. There is no significant difference in the number of students of the three groups who wrote about the home and home life. The number is almost universal in all groups. There is a significant difference in the number of aspects of the home and home life treated by Group I and the other groups. The mean number of aspects treated by each student in each group is 4.20, 3.01, and 3.34, respectively.

2. There is no significant difference in the number of students in the three groups who wrote about the school and school life, but there is a difference in the number of aspects of the school and school life treated by Group I as compared with Group II and Group III. The mean number of aspects treated by each student in each group is 3.19,

2.45, and 2.10, respectively.

3. The number of students in Group I who mentioned the church and church life is significantly larger than the number in each of the other groups. Also, the number of aspects of the church and church life written about is significantly greater. The mean number of aspects treated by each student in each group is 2.34, 1.48, and 1.20, respectively.

4. References to ambition are found in more of the autobiographies of Group I than are found in the autobiographies of Group II or III.

5. References to human relations are found in more of the autobiographies of Group I than they are found in the autobiographies of Group II or III.

6. There is no significant difference in the number of

students of Group I who wrote about leadership and the number of students in Group II who mentioned it, although there is a difference between Group I and Group III.

7. When all six of the above items are combined and tested, it is found that there is a significant difference in the completeness of the autobiographies of Group I as compared with the autobiographies of Group II and of Group III.

447 pages. \$5.70. Mic 57-848

THE PRESENT STATUS OF THE PROGRAM OF STUDIES IN PUBLICLY-SUPPORTED JUNIOR COLLEGES IN THE UNITED STATES

(Publication No. 18,933)

Paul Elmer Ingwell, Ph.D. University of Minnesota, 1956

Adviser: Otto Domian

The primary purpose of the investigation was to analyze the status of the program of studies in publicly-supported junior colleges during 1953-54. Specifically, the analysis pertained to: (1) the extent of courses offered, (2) the relationship between courses offered and those in which there was no enrollment, and (3) the course enrollment in terminal and college-preparatory education.

A 20 per cent random sample of the junior college population was selected. Four geographic regions were designated and small, medium, and large junior colleges were used as the sampling units within these areas. Small colleges had an enrollment between zero and 299, medium schools between 300 and 999, and large institutions 1000 and above.

Primary data used as the basis for analysis were derived from information forms sent to sixty-five junior colleges comprising the sample. Junior college personnel recorded information pertaining to the classification of courses as either college-preparatory, terminal, or both, and the course enrollment for 1953-54. The sample response from 51 colleges, 80 per cent, was considered adequate.

Analysis and interpretation were conducted on: (1) a nationwide basis for all colleges and for small, medium, and large institutions, (2) between geographic regions, and (3) between enrollment groups within each geographic region.

Analysis involved the relationship between the courses offered and those in which there was no enrollment. This was termed reduction in total courses offered. The analysis was completed on a nationwide, between regions, and within regions basis for the total courses, college-preparatory courses, terminal courses, and nonclassifiable courses (those courses not classifiable as either college-preparatory or terminal).

Analysis was also completed for each of twenty-four college-preparatory and ten terminal areas of study. The basis for analysis was: (1) average number of sections offered per college, (2) average section enrollment, and (3) per cent of total course enrollment in each area of study. Extensive analysis was completed for each area of study (college-preparatory and terminal) in which course enrollment was above one per cent of the total course enrollment.

Comparisons were made between the two major categories of education (college-preparatory and terminal). The bases for comparison were: (1) the percentage of reduction in the two categories, (2) the average number of sections offered per college, (3) the average section enrollment, and (4) the percent of total course enrollment in each category. Two statistical tests were employed to test the significance of difference between the percentages of reduction in the two categories, and between the percentages of total course enrollment in the two categories. Other comparisons were descriptive.

In the original design of the study ten questions appeared to warrant consideration. As the thesis developed, an attempt was made in the analysis of the data to resolve each of these questions, and the answers were included in the summary of the study and its conclusions. The questions pertained to the extent of the courses offered and the percentage of reduction in total, college-preparatory, and terminal areas of study; the average number of sections offered per college; average section enrollment; the most significant areas of study (college-preparatory and terminal); and a comparison of college-preparatory and terminal education in the percentage of reduction and the percentage of total course enrollment.

Finally, recommendations and implications were included relative to the organization and the development of the junior college at the federal, state, and local levels. Specific proposals were made relative to the program of studies in the junior college, and research was proposed pertaining to the future development of this institution.

361 pages. \$4.65. Mic 57-849

A MUSIC SYLLABUS FOR JEWISH ALL-DAY SCHOOLS (PARTS I AND II)

(Publication No. 17,656)

Fannie Kreinen, Ed.D. New York University, 1956

Chairman: Professor Abraham I. Katsh

The Problem

The problem of this thesis is to present a syllabus for the teaching of music in the Jewish All-Day school for grades one through six.

Procedures

The problem of this study was broken down into appropriate subproblems consisting of problems basic to the study and subproblems of the study itself. The problems basic to the study are: (1) The Cultural Basis For the Jewish All-Day School; (2) Philosophic Aspects of Judaism; (3) Implications for Jewish Education in General and Music Education in Particular. The findings represented are the results of much careful reading in authorities representing varied points of view on these problems, and not the results of any independent research. These findings constitute Part One of the thesis.

Part Two of the thesis is the music syllabus which developed from the interaction and cooperation of a three-way working team--the writer, the sponsoring committee, and a jury of five qualified experts. The writer was guided

in the selection of material not only by her judgment, which was fortified by training and experience in the fields of general education, Jewish education, and music education, but also by established criteria for the selection of such materials which were approved by the sponsoring committee and the jury. Furthermore, criteria were established for appraisal and evaluation which the writer took into account. Listed for each grade, one through six, are the objectives, activities, materials, sources, teaching aids, suggestions for carrying out the program, and evaluation for the program. Musical playlets, choral recitations with music integrating English and Hebrew elements are included.

533

Summary and Implications

Because the Jewish All-Day school seeks to integrate religious and general education, the teacher of music needs instructional materials concerning the culture of the Jewish group and their heritage, which could be added to the regular course of study in music. This syllabus supplies this need, since it in no way supplants the general music course as offered in the public school, but supplements it with Jewish content. Although the materials of the syllabus are concerned with the basic problem of teaching music, they nevertheless reach out into larger areas of English and Jewish content so that the greatest possible variety of educational experience may result.

Conclusions

It is entirely possible for children to pursue a program of musical learning beginning at the earliest level and continuing through the grades, which embraces the comprehensive fundamentals of musical skill. It is possible for such a program to produce a minimum end result in which every child, not only those especially endowed, but every child who is capable of making normal progress in other school studies, acquires an appreciable degree of competence in singing, sight reading, and an understanding of the elements of musical form. It is possible to put such a program into effect through the use of Hebrew as well as English materials without sacrificing any of the cultural or religious benefits so important in the All-Day school program. And it is possible to do this in the usual amount of time--one hour per week--devoted to music.

The writer has not only presented the basis for such a program, but has also arranged in logical form suggestions and materials for carrying it out. The work ought to prove helpful to all those who wish to initiate a program of music education in their respective schools.

512 pages. \$6.50. Mic 57-850

THE EFFECTIVENESS OF REPRESENTATIVE MATERIALS AND ADDITIONAL EXPERIENCE SITUATIONS IN THE LEARNING AND TEACHING OF FOURTH-GRADE MATHEMATICS

(Publication No. 17,661)

Murray Macy, Ed.D. New York University, 1956

The purpose of the investigation was to compare the extent to which certain manipulative materials and an

enriched experience program helped two heterogeneous fourth-grade classes in a public school in Brooklyn, New York, understand and become proficient in the mathematics for the grade. Growth in computational skill and in attainment of quantitative judgments, concepts and relationships were selected as the criteria.

Twenty-eight pupils from the investigator's class and a like number from another fourth-grade class were selected and matched on the bases of sex, chronological age, and the average of the three standard scores attained on standardized intelligence, reading and mathematical tests. Equal weight was assigned to each of the three factors in computing the average standard scores.

The investigator taught his own class, called Group N, without using any manipulative materials, but provided these pupils with additional experience situations which easily lent themselves to mathematical purposes. At the end of this daily half-hour period with his own class, the investigator immediately proceeded to teach Group M, the other class, with the aid of manipulative materials and a normal experience program. Every two weeks he reversed the order of teaching the two groups. This procedure was followed for the year's duration of the experiment. The official teacher of Group M had been evaluated by the principal as closely matching the investigator in teaching competence and personality, and had been informed previously of the purposes and techniques of the experiment. The scope and general sequence of the mathematics content were in accord with the official course of

Anecdotal records, observations, and interviews, appraised the growth of pupils, with particular emphasis on those areas which could not be effectively probed by written tests. During the course of the study, eight teachermade written tests were administered by the experimenter. At the conclusion of the research, a final standardized mathematics test was given to both groups.

With regard to this final instrument, a test of the significance of the difference between the means of both classes revealed no statistically significant difference between the two groups. There were not less than 5 chances in 100 that the difference could have occured by chance. The means of the eight non-standardized tests also revealed no significant differences between the two groups.

138 pages. \$2.00. Mic 57-851

PROMISING PRACTICES IN ALABAMA HIGH SCHOOLS INDICATED BY EVALUATIVE CRITERIA REPORTS

(Publication No. 19,756)

James Young Moultrie, Jr., Ed.D. George Peabody College for Teachers, 1956

Major Professor: Willard Goslin

The purpose of this study was to identify promising practices in Alabama high schools as indicated by Evaluative Criteria reports. Analyses were made of the written reports of visiting committees to sixty-five public schools in Alabama that had used the 1950 edition of Evaluative Criteria prior to January 1, 1955. Practices were identi-

fied in the following areas: Program of Studies, Pupil Activity Program, Library Services, Guidance Services, School Plant, and Staff and Administration. Tables were prepared showing the frequency of mention by the visiting committees of a certain practice either by commendation or recommendation. These tables were interpreted for strong and weak areas. Attention was given to a brief description of methods that different schools are using in carrying out selected practices. Conclusions were then drawn from these data for further improvement of Alabama schools.

Conclusions

Many promising practices exist in the secondary schools of Alabama. Many outstanding weaknesses also prevail in the schools. Some schools are characterized by strengths in all areas while other schools have outstanding weaknesses in all areas. These conditions portray a definite inequality in educational opportunities throughout the State.

The two main problems of providing salaries for teachers and necessary plant facilities have overshadowed the financing for other important essentials during recent years. Many schools have well-trained teachers in fairly comfortable classrooms, but oftentimes these classrooms are poorly equipped with teaching aids such as library books, reference sets, charts, globes, maps, and other helpful materials.

Certain trends in educational practice appear evident in the Alabama schools. The school leaders indicate a greater feeling of responsibility for all youth that enter the secondary schools. They are more seriously concerned with the development of programs with planned continuity from grade one through grade twelve. One strong and unmistakable trend is that toward a more complete democratization of the schools.

A serious shortage exists in the Alabama schools of appropriate evaluative techniques to determine whether or not the school programs are meeting the needs of the youth enrolled and of the communities served.

Pupil activities are recognized in the Alabama schools as a significant medium through which educational goals may be achieved. However, the small amount of pupil participation in such activities at the junior high school level needs particular attention. Greater effort should also be made to distribute more equitably the responsibilities for sponsoring pupil activities.

The role of the school library has received considerable attention in Alabama during recent years. The library is being considered more and more as a resource center and a service agency for the entire educational program. More effort is being made to assign pupils for study time in library centers where appropriate reference materials are available.

The lack of understanding regarding the essentials of a good guidance program and the absence of a definite organization within the schools to promote guidance services appear to be the most common weaknesses of the Alabama schools as portrayed by this study.

Although much effort has been made to provide appropriate physical facilities for the schools of Alabama, many of the high schools throughout the State are still faced with a serious shortage of classrooms and other necessary facilities.

Most of the Alabama schools are fortunate in having a staff of well trained administrators and classroom teachers to carry on their present programs. However, many of the schools are handicapped by a high turnover of teachers, a shortage of clerical help, and the inadequate quality of custodial personnel. A majority of the schools need to provide additional staff members to enrich their programs and to carry on special services.

209 pages. \$2.75. Mic 57-852

A DETERMINATION OF THE PREVALENCE OF CERTAIN IMPORTANT GENERAL SCIENCE MISCONCEPTIONS AMONG NINTH AND TENTH GRADE SCHOOL CHILDREN

(Publication No. 18,766)

William P. Rogers, Ed.D. Boston University School of Education, 1956

The purposes of the study were: (1) to construct and evaluate an instrument for determining the prevalence of certain important general science misconceptions among ninth grade and tenth grade school children; and (2) to determine the prevalence of responses to this instrument which suggest the occurrence of certain important general science misconceptions among ninth grade and tenth grade children.

Approximately 900 high school pupils and teachers contributed to a list of 741 science misconceptions.

The misconceptions were revised and then examined by 25 science teachers who classified the items as having (1) serious implication for the behavior of the individual, (2) having some implication for the behavior of the individual, (3) having slight implication for the behavior of the individual.

Five inventory forms were constructed with sixty items in each form. Two thirds of the statements were false and one third were true. The true statements were added so the pupils would not discover that they were being tested for misconceptions. The examinees were allowed to respond to each item in a particular form in one of the following ways: true, sometimes true, false, don't know and don't understand. They were allowed as much time as they needed to complete the particular form they were using.

The inventory forms were distributed so that there was national coverage, and when returned, the 2525 usable answer sheets were arranged in twenty groups, according to form, grade and sex. The highest possible score was 39.

An item analysis of each misconception in the five inventory forms used at the ninth grade level was made. Reliabilities of the five forms ranged from .745 to .824.

The following are some of the misconceptions which were believed by at least 50 per cent of both boys and girls in the ninth and tenth grades of the sample and were judged by a jury as having serious or some implication for the behavior of children:

When tobacco smoke is blown through a handkerchief, the yellow mark produced is due to nicotine.

Gasoline burns in the liquid state.

There is always a calm before a storm.

Cream is heavier than milk.

Water always boils at the same temperature.

Water always freezes when its temperature is reduced to 32 degrees Fahrenheit.

Frost is formed usually on the outside of a window.

If you can see many stars in the sky, we will have fair weather.

The sun is the center of the whole universe.

Magnets will pick up many kinds of metal.

Artificial ice is different than natural ice.

A rattle-snake always warns before it strikes.

Those who learn slowly retain more of what they learn than those who learn fast.

Those who threaten to commit suicide seldom do.

A barking dog never bites.

When a dog is fond of a man, it shows that person to be trustworthy.

A drowning person who goes down for the third time is lost.

Women with red hair are quick tempered.
397 pages. \$5.10. Mic 57-853

A STUDY OF BEGINNING TEACHERS — PROBLEMS ENCOUNTERED AND SERVICES SOUGHT

(Publication No. 19,344)

E. Terry Schwarz, Ed.D. The Pennsylvania State University, 1956

This study was undertaken to provide public school supervisors and college-staffs with information on the self-identified problems of elementary teachers with five years of experience or less. The findings should serve as a basis for more effective supervisory and college follow-up services for this group.

Representative groups of beginning elementary teachers in rural, urban and suburban areas whose names and schools were kept anonymous were asked to write freely of the problems which they felt affected their teaching in the current year. They were requested also to explain how they felt that supervision and college follow-up programs could help them to solve these problems. Four qualified judges in the field of elementary education studied and categorized the problems submitted, and the study was organized on the basis of this analysis.

Human relations problems with children, administrators, other teachers, parents, and citizens were mentioned by 91.2% (195) of the participants. Some 74.3% (159) reported problems of self-adjustment, which included feelings of inadequacy, conflict in personal-professional roles, marriage, personal problems of varying kinds, salary, professional growth, further education and community stereotypes.

Desire for more teaching skill is common to 59.4% (127) of these beginners. Feelings of inadequacy and difficulty in discipline were especially severe problems in the first and second year of teaching.

Of the participants questioned, 53.4% (136) felt that supervisors could help them solve their problems through consultant services, personal encouragements, constructive criticism, classroom demonstration and miscellaneous services. Of the beginning teachers asked, 66.4% (142) felt that college follow-up programs through resource centers, individual classroom assistance, workshops, seminars and internships could help them solve their problems.

Colleges should put into practice curricular activities designed to meet personal and professional needs of teachers at both the pre-professional and graduate levels. Such activities might be special courses, discussions, and sound guidance programs for young adults, who are today's teachers.

Programs of supervision in public schools need to be developed to include in-service activities designed to help the beginning teacher with personal and professional problems which affect his teaching. Seminars, workshops, and individual interviews where beginners may freely air their problems of self-adjustment, human relations, and teaching skill should be sponsored by public schools.

School administrators need to study those problems of beginning teachers which can be alieviated by administrative action. Teachers' daily schedules need to be arranged to allow for necessary rest periods. Administrators need to assess the excessive demands made on teachers' time for P.T.A. nieetings, faculty meetings, parent conferences, committee meetings and other school activities in order to make necessary schedule adjustments which will provide for maximum teaching efficiency. More effective administrative systems for getting necessary instructional materials to the teacher need to be devised. These are illustrative of many problems which need administrative action.

School boards need to act in informing the community of teachers' needs. Higher salaries, better working conditions, more adequate living conditions, and acceptable social status for teachers are problems which need lay understanding and action.

VITA

E. Terry Schwarz was born April 2, 1920 in Philadelphia, Pennsylvania, and was graduated from Kensington High School For Girls, 1938.

She received her B.S. Degree, 1942, from West Chester State Teachers College: M.Ed., 1948, from the University of Pennsylvania; and the D.Ed. from The Pennsylvania State University, June, 1956.

Her elementary teaching was at Oak Lane Country Day School of Temple University, Radnor Township, the University of Wisconsin, and the University of California, Berkeley.

A member of the elementary staff of Temple University, 1951-52, and director of elementary education at Bucknell University until 1954, presently employed as instructor in elementary education at The Pennsylvania State University. 159 pages. \$2.10. Mic 57-854

A STUDY OF PUBLIC SCHOOL INTEGRATION IN TWO ILLINOIS COMMUNITIES

(Publication No. 19,765)

Harold Edward Turner, Ed.D. George Peabody College for Teachers, 1956

Major Professor: William Van Til

This study considered the events which occurred in East St. Louis and Alton, two neighboring cities in Illinois. These cities experienced the transition from segregated to desegregated schools between 1949 and 1952. It was hoped that a careful examination of the communities and the events which transpired therein would yield some insights and implications for others confronted with similar problems. The written material dealing with the events in each community was reviewed. Each city was visited and 20 persons actively involved in each of the transitions were interviewed regarding those events. The persons were asked to describe the events as they knew them and to give their opinions of desegregation practices.

Summary of Data

A Negro group in East St. Louis, led by the local NAACP, successfully broke the pattern of segregation which had been in existence. Negro students attempted to enroll in "white" schools with the beginning of the second semester in 1949. They remained for three days attempting to gain admittance before returning to their old schools. A suit was filed by the Negroes attempting to force desegregation through court action.

The State Legislature passed the Jenkins Amendment in June, 1949. This held up State Aid to any school system in Illinois practicing segregation. When the white leaders in East St. Louis realized they were in an untenable position, they made strong efforts to institute a peaceful and successful transition. This came about in January, 1950 when the first Negro students were permitted to enroll in the school nearest their home.

Encouraged by the action in East St. Louis the Alton Negroes initiated a similar campaign. Negro students attempted to gain admission to "white" schools in January, 1950. Government mediators were employed to safeguard a peaceful solution. After an unsuccessful attempt to gain admission, a lawsuit was filed asking that Alton State Aid be withheld. The Alton schools were eventually opened to Negroes in January, 1952. The resistance to such a transition was much more noticeable in Alton than in neighboring East St. Louis.

As a result of this study several conclusions were reached.

The person in authority can do much to influence thought and action toward desegregation.

Authorities such as the court or the government are important factors in the process of desegregation.

Opposition can be effectively met by a firm and positive stand.

Successful desegregation might start with an official adoption and announcement of policy.

Public opinion plays a large part in the process of desegregation.

Persons within a specific community may tend to agree more than do those within a particular race.

Active and intelligent leadership is necessary for the transition to be successful.

Each community has characteristics which make it unique; most communities have some characteristics which are similar to those in other communities.

Control of finances can be a significant factor in desegregation.

Athletics were an important catalytic agent in the desegregation process of East St. Louis.

Advance planning is important for successful results. Communication lines must be set up and functioning for adequate success.

Favorable publicity is of great importance.

High economic level is not a necessary index of successful transition. 357 pages. \$4.60. Mic 57-855

A REVIEW OF DOCTORAL DISSERTATIONS IN MUSIC EDUCATION

(Publication No. 19,888)

Richard Albert Worthington, Ed.D. University of Illinois, 1956

The problem of this study was to conduct a review of the doctoral theses which had been completed by doctoral candidates majoring in music education or by individuals who were interested in the field of music education. Emphasis was placed on the areas of concentration within music education which were investigated by these theses; the methods of research used by the researchers; and a summary of each thesis indicating its problem, the procedure utilized to solve the problem, and the conclusions reached by the thesis.

The study limited itself to those theses which were reported to have been completed during the period 1940 to 1954. The data required for the summarization of each individual thesis was obtained through visitations to the libraries where the theses were on file, through securing copies of the theses through interlibrary loan, and through use of available material at the University of Illinois Library. The theses were then classified according to the methods of research each used and according to the area of concentration each investigated.

Data were secured from and summaries written about three hundred and ninety-one theses of a basic list of three hundred and ninety-seven. This number represents a coverage of ninety-eight and three-tenths per cent.

The areas of concentration within music education which have been investigated by the doctoral theses reviewed in this study include the curriculum area - one hundred and sixty-four theses, methods of teaching - forty-one theses, musicology - twenty-nine theses, psychology of music - twenty-three theses, philosophy and aesthetics - twenty-one theses, musical performance - nineteen theses, history of music education - eighteen theses, administration - fifteen theses, guidance - thirteen theses, evaluation - ten theses, and supervision - eight theses. Thirty-two of these dissertations investigated subjects of a miscellaneous nature.

The methods of research utilized by these music education doctoral theses and the number of theses which used each method are as follows: descriptive research - two hundred and one theses, historical research - forty theses, action research - thirty-five theses, philosophical research - thirty-four theses, experimental research - twenty-five theses, test construction research - nine theses, and creative research - two theses. Forty-six of the theses included in this study could not be clearly classified in any of the established methods of research and were included in a miscellaneous category.

The information secured in this study can be the basis for objective evaluations of doctoral theses in music education and for further intelligent guidance of research in this field.

592 pages. \$7.50. Mic 57-856

EDUCATION, ADMINISTRATION

AN INTERVIEW FOR SELECTING TEACHERS

(Publication No. 18,676)

Loren Richard Bonneau, Ed.D. The University of Nebraska Teachers College, 1956

Adviser: F. E. Henzlik, Ph. D.

The purpose of this study was to devise an interview which would aid school administrators in selecting teachers who would develop positive rapport with their students.

Procedures

To determine the positive rapport which teachers established, 2110 students in eight schools rated their respective teachers on a scale ranging from a high of five to a low of one on questions which determined (1) how well they liked their teachers, (2) how much they believed they learned from their teachers, and (3) how easy it was to obtain help from their teachers.

A teacher interview was designed and administered to 14 teachers, revised and administered to these and 31 additional teachers. A scoring manual was devised from the responses of these 45 teachers to 18 interview questions. Categories for each question were assigned weighted scores which were dependent on the mean total pupil ratings given the teachers. Biographical information was also obtained from the teachers, Minnesota Teacher Attitude Inventories (MTAI) were administered and the principals and superintendents rated their teachers. These techniques were administered to 80 additional teachers. This time the Teacher Interviews were scored according to the manual and the scores were correlated with the ratings each teacher received from his pupils. The instruments used in this study were also analyzed statistically.

To determine the significance of differences among the pupil ratings, an analysis of variance: multiple classification was used. Coefficients of correlation were used to study the relationships between instrument scores and items in the tests.

Results

The correlation between the Teacher Interview Ratings and the pupils' ratings of their teachers was .65. This

means that teachers who develop positive rapport with students can be predicted with higher probability by the Teacher Interview than by administrators who have daily contact with the teachers.

Pupil Ratings of their Teachers.

The analysis of variance: multiple classification showed no significant differences among the pupil ratings with (1) sex of teachers, (2) sex of pupils, (3) pupil interview items, (4) sex of teachers by item, and (5) sex of pupils by item. There were significant differences among the pupil ratings with (1) class level in school and (2) all other subgroups.

Teacher Interview Rating.

1. Intercorrelations of the Teacher Interview questions indicated that many of the questions were contributing a unique measure of teacher success.

2. The coefficient of reliability was found to be .87 when corrected which was highly satisfactory.

3. An item analysis of the questions first with the pupils' ratings of teachers and then with the total interview rating less that question showed that most of the questions contributed significantly to the extent which teachers who established positive rapport with students could be predicted.

The Administrator Questionnaire

The correlation between the superintendents' ratings of teachers and pupils' ratings was .42 while the correlation between the superintendents' ratings and the interview ratings was .40. Similar correlations when the principal was considered were .33 and .31 respectively.

The results of the biographical data and the MTAI scores were found to be of little value in determining positive teacher-pupil relations.

Implications

The results of this study indicate that further analysis of the Teacher Interview is warranted for the purpose of selecting teachers.

It appears that administrators would do well to implement the Teacher Interview to select teachers who will establish positive rapport with pupils.

Other studies could be conducted to devise an interview to select desirable elementary or college teachers.

196 pages. \$2.55. Mic 57-857

AN ANALYSIS OF PUPIL TRANSPORTATION COST DEVIATIONS IN SELECTED KENTUCKY SCHOOL DISTRICTS

(Publication No. 19,737)

LaRue Cocanougher, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Willard E. Goslin

The purpose of this study was to determine some of the reasons for variations in pupil transportation costs among selected county school districts in Kentucky.

Methodology

The following steps were taken in making this study:

- 1. The school districts were selected for study by the use of the following methods of cost prediction:
 - (1) A regression equation was formulated by using total daily transportation cost of each district as the dependent variable with average number of pupils transported daily and total daily miles as the two independent variables.
 - (2) A graph was made of annual transportation cost per pupil of each district as the Y variable and average daily attendance of transported pupils divided by total daily miles as the X variable.
- 2. The school districts selected for study were those where actual transportation costs deviated one standard error or more from the means of the regression equation and also one or more standard deviations from the means of the columns on the graph.

3. The twenty districts studied by the interview technique were grouped into high and low cost samples with ten districts in each sample.

4. The significance of the variation of data obtained from the districts of the two samples was determined by the use of chi-square and "t" ratio with a significant level of .05.

Summary of Findings

Twenty-four of the seventy-seven comparisons made of costs, practices and conditions varied significantly.

The most important variations were:

- 1. Records and Reports Required
- 2. Average Utilization
- 3. Cost of Bus

Summary of Conclusions

- 1. From the results of cost correlations of this study, the use of weights for poor roads seems to be unjustified in Kentucky for the present method of state aid distribution.
- 2. Due to wide variations of cost among the districts studied, the method of distributing state aid based on average costs is questionable.
- 3. The efficiency of pupil transportation of the high cost districts could be improved if operation procedures of low cost districts were used.
- 4. It is extremely doubtful if the low cost districts are operating at maximum efficiency.
 - 5. Uniform methods of accounting are greatly needed.
- 6. Comparisons were limited due to lack of available data.
- 7. Written policies of the district board of education were very limited for both samples.
- 8. A great need exists for improved preventive maintenance programs in districts of both samples.
 - 9. There is a need for more driver training programs.

Summary of Recommendations

The writer recommends that the Kentucky State Department of Education assume the following obligations as a means of obtaining more efficient programs of pupil transportation.

- 1. A uniform accounting system should be inaugurated.
- 2. Records showing complete cost data should be required for each district-owned transportation vehicle.
 - 3. A detailed description of each route should be

submitted and approved by the State Department of Education in order that a minimum quality of service could be made mandatory.

- 4. A set of minimum operating standards for pupil transportation should be required of each district board of education.
- 5. Minimum standards for driver training programs of each district should be adopted.
- 6. The state should receive bids on school bus bodies and chassis. The school districts would not be required to buy on state bids, but no price paid for equal or inferior quality should exceed the state bid price.
- 7. Excessive contract costs should be carefully examined by the State Department of Education.
- 8. There should be annual evaluations of the method of state aid distribution in terms of current data.

160 pages. \$2.10. Mic 57-858

EDUCATION

FACTORS INFLUENCING THE SUCCESS, OR FAILURE, OF ADMINISTRATORS IN NEBRASKA'S CLASS III SCHOOL DISTRICTS

(Publication No. 18,677)

Bruce Eric Cowgill, Ed.D.
The University of Nebraska Teachers College, 1956

Adviser: Merle A. Stoneman, Ph. D.

Purpose and Procedure of the Study

The purpose of the study was to determine what factors school board members deemed most important in judging and rating their administrators. The study was also concerned with the attitudes of board members in regard to personal habits of the administrator, and the school board-superintendent relationships on administrative practices.

The first step involved a summarization of the recent writings concerning good and accepted practices in this area. A review was then made of the studies related to this problem

A questionnaire was constructed and sent to the presidents and to the secretaries of school boards in Class III School Districts in Nebraska. The questionnaire was divided into three sections. The first section was concerned with superintendents who had been dismissed, superintendents who were considered successful, and superintendents who were not considered successful but who were not inefficient enough to dismiss. The factors pertaining to each were discussed. The second section of the questionnaire called for a "yes" or "no" response to given personal traits, personal habits, and administrative practices of superintendents. The third and final section of the questionnaire called for the checking of listed traits that would influence board members greatly or would not influence them greatly in deciding upon the retention of their administrators. Board members also evaluated their administrators on these traits.

A total of over fifty-eight per cent of the board members contacted returned completed questionnaires. This was deemed a sufficient return to make the study. The data from these returned questionnaires were tabulated, analyzed, and included in the study.

Conclusions and Recommendations of the Study

Nearly all of the board members had superintendents that they had considered successful. Factors that pertained directly to the administration of a good school system were listed as reasons contributing to an administrator's success more times than were personal factors or factors dealing with public relations.

There was no general agreement among school boards or board members as to how much freedom a superintendent should have in areas related to his personal life.

There was general agreement among school boards and individual board members that the boards of education with the help of teachers and superintendents should establish administrative policies and then refer them to the superintendent for execution. There was no general agreement as to what these policies should be.

Board members indicated they would be influenced more in their decision on retention of their superintendent by his administrative practices than by his personal traits or his personal habits.

In those cases involving the dismissal of superintendents it was a matter of administrative practices more than personal habits that led to their dismissal. It was in only a few cases that the character of the superintendent was challenged.

Almost all of the board members desire a long range planning program for operation in their schools. They felt that the superintendent should take the lead in planning such a program. They wanted issues brought into the open for discussion.

There is need for an understanding between superintendent and board members concerning the duties of each. In some areas of school policy the board members need training and leadership. Emphasis should be given to immediate and long range planning. It is the responsibility of the superintendent to provide leadership.

183 pages. \$2.40. Mic 57-859

A RESTUDY OF THE SCHOOL DISTRICTS IN TWO RURAL COMMUNITIES TO DETERMINE THE EFFECTS OF REORGANIZATION

(Publication No. 17,308)

Carl Eisemann, Ph.D. The University of Wisconsin, 1956

Supervisor: Professor Burton W. Kreitlow

I. Statement of the Problem

This study is the first replication of a long term study at the University of Wisconsin to determine the effects of school district reorganization. The purpose of this study is to evaluate the changes which have occurred in two communities and their schools and to draw some conclusions which may be utilized in substantiating or rejecting the values of school district reorganization.

II. Procedures or Methods

This research concentrated on appraising and evaluating the Winneconne and Denmark communities on four points.

The relationship of school district reorganization to (1) educational opportunity, (2) educational results, (3) educational costs, and (4) community and neighborhood social structures and processes was studied to determine the extent that reorganization accomplishes the objectives of educational improvement.

The communities were initially selected and appraised in 1949, and a series of 'bench marks' established which could be used as starting points for measuring the changes which occurred in the reorganized Winneconne and the non-reorganized Denmark communities.

Administrators, teachers, lay people and parents of first and sixth grade pupils were interviewed to determine school philosophy, educational opportunities, socioeconomic status and community identification. First and sixth grade pupils were tested for intelligence, achievement, and interests.

The Fisher-Behrens 'd' test was applied to the data which was amenable to such treatment.

III. Results

The results of this study are reported in four categories.

Educational Opportunities

The Winneconne community was found to be superior to the Denmark community in almost all aspects of educational opportunity. They provided a greater number of facilities and services in the areas of teaching materials, health and safety services, and pupil services.

Educational Results

The mental and chronological ages of the Winneconne first and sixth grade pupils were not significantly different when compared to those of their counterparts in the Denmark community. However, the 1949 Denmark first grade pupils were superior in some achievement test scores at the five per cent and one per cent level of significance. Ey 1954, these same Winneconne pupils had surpassed the Denmark pupils in almost all parts of the achievement tests. The differences were significant at the five per cent or one per cent level.

Educational Costs

The 1949 per pupil costs in the Winneconne area were below those in the Denmark area. By 1954, the Denmark pupil costs were below those in Winneconne.

Community Structures and Processes

The Winneconne area shows less identification with the services provided in its community. In respect to the six basic services identified by Thaden, Denmark must be classified as a strong community. However, the community is still more homogeneous in character than the Winneconne community, and has a lower acceptance pattern for the Denmark High School.

IV. Conclusions:

This study has produced some evidence in three categories:

1. Reorganization appears to be one of the important factors in producing higher achievement.

2. The homogenity of the Denmark community has decreased but not sufficiently to create a readiness to accept the changes needed for school reorganization.

3. There is evidence that strong identification with the community services and trade patterns is not necessary for a community type school system.

Each of the conclusions requires further research in other communities.

The most challenging phase for additional study is the indication that the school may be a community school without being restricted by the limitations of the predetermined physical and sociological entities which identify other community structures.

203 pages. \$2.65. Mic 57-860

AN ANALYSIS OF THE PREPARATION PROGRAM IN EDUCATIONAL ADMINISTRATION AT GEORGE PEABODY COLLEGE FOR TEACHERS

(Publication No. 19,745)

Martin Byron Garrison, Ed.D. George Peabody College for Teachers, 1956

Major Professor: W. H. Vaughan

The purpose of this study was to analyze the preparation program in educational administration at George Peabody College for Teachers and to make recommendations for program improvement based on the analysis. The analysis included activities sponsored by the Division of Educational Administration and Community Development. General reference was made to contributions of other divisions of the College in preparing school administrators.

The frame of reference for the analysis was based on the Competency Pattern developed by the Southern States Cooperative Program in Educational Administration. Checklists were prepared from the Competency Pattern and submitted to the professors in the Division. Data supplied on these lists were used to determine the duplications in courses and the gaps in total coverage.

Supporting data for analysis of the courses were supplied by professors on a separate form. This form asked for a general description of the course, general and specific competencies sought, topics covered, instructional methods used, and evaluation procedure used.

The frame of reference was further strengthened by a review of literature directly related to the study, review of activities in other regional centers of the Cooperative Program in Educational Administration, interviews and conferences with the instructional staff, and visits by the writer to other institutions of higher learning offering graduate programs in educational administration.

A survey was made by questionnaire of the opinions of a selected number of recent graduates concerning the strengths and weaknesses of the program. The graduates were also asked to make recommendations for program improvement.

The findings of the study were a result of a synthesis of data from these sources. Recommendations were based on the findings with a view to implementing desired practices and procedures through a specific program.

Findings of the Study

The course analyses based on data supplied by professors revealed comprehensive coverage of topics listed in

the Competency Pattern. Technical skills as defined in the Competency Pattern were not treated comprehensively. Lecture with class discussion is the principal method of instruction used. Little emphasis is placed on sequential planning in the arrangement of courses. The program is weak in focusing activities toward preparation for specific jobs.

Graduates feel that the major strengths of the program are the quality of personnel of the faculty and the number of courses available. The major weaknesses named by the graduates were the lack of opportunities to learn how to apply principles of administration to on-the-job situations and failure of program to focus training on job performance. Their recommendations for program improvement included suggestions for correcting weaknesses named.

Recommendations

Recommendations for continued program improvement were made on the basis of the analysis. The practicality of implementation was considered in the proposals for program revision. Recommendations included: organization of a basic course in school administration to be required of all students majoring in the field, flexible course requirements, design of course work beamed toward job preparation, increased learning activities off the campus, more emphasis on the two-year program, improved recruitment procedure, improved preparation for college administrators, and improved doctoral program. The purpose of the recommendations was to provide a framework within which a more effective program could be administered.

286 pages. \$3.70. Mic 57-861

A HISTORICAL STUDY OF ACCREDITATION IN NEGRO PUBLIC AND PRIVATE COLLEGES, 1927-1952—WITH SPECIAL REFERENCE TO COLLEGES IN THE SOUTHERN ASSOCIATION

(Publication No. 19,989)

Louis Charles Goodwin, Ph.D. New York University, 1956

Chairman: Professor Alonzo F. Myers

This study investigates the history of accreditation in Negro public and private colleges in the North Central and Southern Associations of Colleges and Secondary Schools from 1927 to 1952 by (1) identifying historical forces related to the development of accreditation in Negro colleges, (2) studying the standards and procedures employed in accrediting these colleges from 1927 to 1952, and (3) analyzing the strengths and weaknesses of the accrediting standards and procedures applied to them with a view to making suggestions for possible improvement in the future.

The data were obtained from (1) primary and secondary sources, comprising the accrediting files of the participating colleges, publications of the Associations, and standard works in higher education and the higher education of Negroes; and (2) interviews with officials of the two regional associations, State Directors of Negro Education, and college administrators.

This study employs primarily the historical method. A

survey and analysis were made to determine strengths and weaknesses in the accrediting of Negro colleges. Reviews of the accrediting movement in the United States and of the standards of both Associations were made to show trends up to 1952. The participating colleges are on the approved list of the respective Associations and were selected randomly. An item analysis procedure of tabulation yielded strengths and weaknesses from which the level of excellence of the participating colleges was determined.

This study reveals that no differentials existed in the application of standards to Negro colleges in the North Central Association. Until 1952, the Southern Association applied the standards to Negro colleges on a differential basis as evidenced by separate machinery under a Committee on Approval of Negro Schools. The North Central Association allows considerable latitude to the colleges within its territorial boundaries in meeting its several criteria. This explains why some Negro colleges in that Association did not measure up to some criteria. It does not deny approval because of a weakness in a college program. Considered collectively, the colleges measured up favorably to the standards applied to them.

For the procedures applied to Negro colleges in the Southern Association, two significant findings were revealed: (1) a difference in the procedural application, and (2) the approval of colleges when data revealed approval should have been denied.

The following conclusions are derived from the study:

- 1. Each facet of a college program should be evaluated in terms of the avowed philosophy and objectives of the college.
- 2. The North Central Association has achieved a refinement in standards and procedures without differential application to colleges within its geographical boundaries that lessens institutional uniformity and stimulates improvement in the quality of its educational offerings.
- 3. The Southern Association up to 1952 employed a distinctly different procedural pattern in the accreditation of Negro colleges.
- 4. Officials in some Negro colleges hold some responsibility for the perpetuation of a dual procedure by the Southern Association because of the need to facilitate the procurance of additional funds and for the enhancement of institutional prestige.
- 5. The specifications of some Southern Association standards duplicate each other.
- 6. The Southern Association provided a greater stimulus to the growth and development of Negro colleges.

The following recommendations seem justified from the findings and conclusions of this study:

- 1. This study may serve as a preliminary to a series of studies relating to the upgrading and evaluation of Negro colleges.
- 2. The Southern Association should abandon its quantitative standards as a stimulus to greater institutional individuality.
- 3. The Southern Association should revise its standards in order to eliminate duplication and structure them so that institutional responses can be more objectively stated.

- 4. The Southern Association should continue to evaluate colleges without making special concessions to Negro colleges.
- 5. The Southern Association should grant full membership to Negro colleges to which it grants unconditional approval. 328 pages. \$4.20. Mic 57-862

THE PREDICTIVE VALUE OF CERTAIN MEASURES
USED IN SELECTING FRESHMEN FOR THE
TECHNICAL CURRICULA IN A COMMUNITY COLLEGE

(Publication No. 19,990)

Hugh Halsey, Ph.D. New York University, 1956

Chairman: Professor Alonzo F. Myers

The rate of student attrition in the community colleges of New York State is a matter of deep concern to these new institutions. As these colleges have become better known many applicants for admission have had to be turned away for lack of space. Because these schools are publicly supported, the process of selection must be as objective as possible and as effective as present knowledge can make it. Although many studies have been made of prediction of success at the four-year college level, few have been made for community colleges. The criteria of college success is generally the cumulative average at the end of the freshman year, as in this case.

This investigation deals only with the technical curricula of a community college--construction, electrical, industrial chemistry and mechanical technologies--for the sake of uniformity of subjects studied in the first year. The purposes are to find (1) the best available combination of measures to use in selecting freshmen (2) what relation marks in specific high school subjects bear to success in corresponding college subjects and (3) what relationship numbers of mathematics courses taken in high school have to physics, mathematics and over-all success at the college.

The measures available for study include the high school record, the results of a mathematics test constructed by this investigator, and the results of seven of the Differential Aptitude Tests of the Psychological Corporation. High school marks were adjusted to a scale with a common passing mark and the simple average of the elementary algebra, general science, American history, and third-year English was calculated. This average is designated the high school index.

The zero-order intercorrelations between the dependent and the nine independent variables were found and tests for linearity and significance applied. The correlation coefficient for 389 cases between the high school index and college success is .52, the highest. The coefficients between college success and the various tests range from .40 to .09. The Wherry-Doolittle test selection method was applied. The measures selected in order are: the high school index (X_1) , Numerical Ability (X_2) , Sentences (X_3) , and Mechanical Reasoning (X_4) . The last three are components of the DA tests. The multiple correlation coefficient is .601 with a standard error of estimate of .487.

The multiple regression equation in raw score form was found to be:

 $\overline{X} = .0414X_1 + .0136X_2 + .00957X_3 + .00782X_4 - 2.201$

The Taylor-Russel method of interpreting the effectiveness of prediction of validity coefficients indicates that by the use of this equation as much improvement over the present method will result as the present method is an improvement over a purely random process.

No significant difference in over-all success between students who had only elementary algebra and those who had plane geometry and intermediate algebra in high school was found but taking one of the advanced courses in mathematics does produce a significant difference. Those who had a second advanced course were significantly better off than those who had but one advanced course. A third course, however, seemed to produce little improvement.

The effect of numbers of mathematics courses in high school on success in physics is quite similar to that on over-all success except that the taking of a second advanced course produces no improvement over only one, but a third produces a significant difference over one advanced course.

Beyond plane geometry an increase in the number of mathematics courses produces progressively significant changes in performance in college mathematics.

The results of this study are based on sufficiently large numbers to justify an expectation of material improvement in percentage of successes if used in colleges similar to that of this study.

115 pages. \$2.00. Mic 57-863

IMPLICATIONS OF THE GREENBRIER COUNTY STUDY FOR SCHOOL ADMINISTRATIVE STAFF OPERATION

(Publication No. 17,632)

Arthur Newsome Hofstetter, Ed.D. University of Virginia, 1956

Statement of the Problem. This study is an analysis of administrative staff operation during a cooperative study of the schools and communities of Greenbrier County, West Virginia. The study had two major purposes: (1) to analyze administrative staff operation through all the phases of The Greenbrier County Study, and (2) to derive the implications of the study and make recommendations for school administrative staff operation in Greenbrier County.

Methods and Procedures Employed in Gathering the Data. The Greenbrier County Study was made as a part of the West Virginia Cooperative Program in Educational Administration. Consultative aid in making the study was obtained from the staff of the Cooperative Program in Educational Administration of the George Peabody College Center, Nashville, Tennessee. The central administrative staff, the school principals, the teachers, and approximately 3,400 lay people participated in examining the Greenbrier County schools and their relationships to their communities during the school year 1953-54.

The personal interview technique was used in order to

obtain information concerning the administrative procedures used in the initiation and development of The Greenbrier County Study and the reaction of participating personnel to these procedures. The writer interviewed members of the central administrative staff, principals, teachers, members of the Board of Education, and laymen who had participated in the county study. Interviews were continued in each area of investigation until the writer felt that he had acquired correct information concerning the administration of The Greenbrier County Study in the respective areas.

The interviews were consolidated into case studies for the central administrative staff, each of the twelve high school attendance areas, and the one room schools. The findings of this study were based on (1) the case studies, and (2) the literature presented in this study.

The Findings of the Study. Faulty and insufficient prior preparation by the central staff was a cause of the lack of (1) cooperation, (2) desired understandings, and (3) readiness of principals and teachers. High school attendance area meetings could have been effective in prior preparation for the study. There was a lack of interest in and a resistance to the study in schools where (1) communication from principals to teachers was inefficient or lacking, and/or (2) central staff communications did not receive support through positive action of the principals.

The failure of the central administrative staff to allow principals and teachers a share in planning policy and procedures in the study was a cause of resistance and lack of cooperation. Group acceptance of the study was desirable to create and maintain a cooperative group climate. Teachers were cooperative and productive in the study when school time was made available. The attitudes and/or reactions of the teachers in The Greenbrier County Study were traceable to the attitude and/or action of the principal in presenting the study to them.

There was teamwork in those schools where there was group acceptance of the study and group recognition of common goals. The work of administering the study was facilitated in schools where teachers worked as a team. There was a need for an overall philosophy of The Greenbrier County Study acceptable to and accepted by all of the school administrators.

There was teacher cooperation, teacher interest, and the administration of The Greenbrier County Study was facilitated in those schools where the principal as administrative leader (1) led teachers toward acceptance of the study, (2) sought to keep teachers informed, (3) encouraged teacher participation in planning and policy making, (4) delegated administrative functions to teachers, (5) aided in the formation of teacher teams, (6) led discussions on the interpretation of policy, (7) attempted to obtain a fair distribution of the teacher work load, and (8) coordinated effort in the work of the study.

369 pages. \$4.75. Mic 57-864

DEFINING AND PROJECTING THE OFFICE OF THE DEAN OF WOMEN AT THE UNIVERSITY OF HOUSTON

(Publication No. 19,358)

Theo M. Hunnicutt, Ed.D. University of Houston, 1956

The primary objectives of this historical study were:
(1) to record for the archives of the University of Houston the history of an integral part of the institution, (2) to validate the office of the Dean of Women as established at the University of Houston, and (3) to investigate and make a critical analysis and evaluation of the office of the Dean of Women in light of theory and practice.

The secondary objectives of this study were: (1) to define and project the duties and responsibilities and functions of the Dean of Women's office at the University of Houston, (2) to evaluate present practices in terms of future growth with continuous improvement in mind, and (3) to show the large part the students have played in the formulation and establishment of the office of the Dean of Women.

The ultimate objectives of this study were: (1) to define the basic goals and tenets of the Dean of Women's office in light of their application at the University of Houston, (2) to formulate a program of procedure for the rapid expansion of the office of the Dean of Women, and (3) to recommend to the administration certain proposals and suggestions for the improvement of the office of the Dean of Women.

In order to accomplish the goals, research into old records of the University of Houston, newspaper files, and other media furnished the background and history of the Dean of Women's office from 1928 until 1950, when the present office of the Dean of Women was established. The first several chapters follow the working of the Dean of Women's office (which was in effect an attendance office and was discontinued in 1943) and includes the many plans, reports, and suggestions of faculty, administration, and students submitted prior to 1946, when the present office of Assistant Registrar and Women's Counselor was established.

In 1950 when the present Dean of Women's office was established, the National Association of Deans of Women, the administration, faculty, and student groups contributed suggestions regarding philosophy, goals, structure, et cetera. The first several years of the office of the Dean of Women were the formulative, unstructured years in which the everyday needs and demands of the students were met, and from this knowledge, the practical, actual working plan for the Dean of Women's office was evolved.

In order to critically evaluate the services of the Dean of Women's office after three years of service, a questionnaire was prepared by the Women's Student Association in May of 1954, in an effort to determine the effectiveness of such a personnel office, to evaluate services, attitude, philosophy, and shortcomings of such an office. A total of one hundred and ninety-three students participated in this survey, which included women from the Women's Student Association, College of Nursing, sorority groups, independent groups, and professional organizations. A random sampling of seventy-two students was selected, and reports appear elsewhere in this study.

On the basis of the Women's Student Association questionnaire, comments from the administration, faculty, and students, the recommendations were respectfully submitted to the administration of the University of Houston upon the resignation of the Dean of Women in June of 1955.

246 pages. \$3.20. Mic 57-865

PLANNING MUSIC FACILITIES FOR THE SECONDARY SCHOOLS

(Publication No. 19,904)

Wayne Noll Jordan, Ed.D. Stanford University, 1956

The Problem

The problem of this study is concerned with a principle of planning educational facilities. Recent literature in school administration recommends that school facilities be planned from the activities of the educational program. The application of this principle to a specific situation becomes "educational specifications", which, in turn, serve as a communicative vehicle to the architect so he can plan better school facilities.

Because the literature concerning music facilities has not utilized this principle, this study is particularly concerned with proposing adequate procedures for planning music facilities, and presenting some descriptions and illustrations of music facilities for secondary schools.

Procedures and Sources

The procedures suggested for educational specifications are: (1) description of the music program to be housed; (2) the interpretation of this program to the architect by the medium of the various factors in school planning; and (3) some descriptions and illustrations of specific music facilities.

For this study, the materials resulting from the application of the above procedures to the area of music education are organized along the following lines:

(1) Chapter One defines the problem.

(2) Chapter Two describes the activities of a music education program for the secondary schools. This program was derived from three compendiums of the music education profession: Music Education Source Book Number One, and Music in American Education, source book number two of the Music Educators National Conference, and Part II of the 35th Yearbook of the National Society for the Study of Education entitled Music Education.

(3) Chapter Three interprets this music program to the architect in terms of the factors in school planning. The sources of information for this chapter are: (a) visits to music facilities which were built since 1950 at twenty San Francisco Bay Area secondary schools, (b) floor plans and descriptions of music facilities that were found in current literature, and (c) discussions with several architects and music educators of the San Francisco Bay Area.

(4) Chapters Four, Five, and Six contain descriptions and illustrations of rehearsal rooms, auxiliary rooms, and equipment and furnishings of a music department.

(5) Chapter Seven demonstrates in totality the use of

the principle of educational specifications in planning the music facilities of a fictitious secondary school, and represents the summary and recommendations of the writer.

Summary and Recommendations

The writer proposes that the planning of functional music facilities can be realized better when the school architect is provided with a set of educational specifications. These specifications should be developed by a committee composed of music educators, school administrators, parents, students, and professional consultants. The procedures of this committee should consist of: (1) a study of the music program in terms of activities, enrollments, course offerings, teaching procedures, administrative policies, community activities in music, and the equipment used; (2) interpreting this music program to the architect in terms of the various factors in school planning; and (3) describing and illustrating the recommended facilities.

Recommendations on the major problems discovered in this study are summarized below:

- (1) The separate music building is the most ideal arrangement because it isolates the sound, allows for better management and supervision, and lends itself more satisfactorily to expansion. At the same time, the music building should have reasonable access to the auditorium stage, to the regular day-student, and to the public. The best intra-departmental arrangement is for the large rehearsal room(s) to be the nucleus about which the other rooms are placed.
- (2) Music room lighting is a particular problem because of varied seating arrangements coupled with a need for good illumination. There appears to be a trend away from the use of natural lighting in large rehearsal rooms because of problems of acoustics, sound transmission through open windows, and the impossibility of avoiding someone facing a windowed area when in a varied seating arrangement.
- (3) The application of the scientific information in architectural acoustics to music rooms is of such importance that the employment of an acoustical engineer as a consultant is recommended. Usual defects in acoustics ---echoes, sound foci, dead spots, and excessive reverberation---can be controlled by using sound-absorbing materials, non-parallel walls, and wall splaying.

(4) The problem of sound insulation is that of preventing sound transmission through walls, floors, ceilings, windows, and air and heating ducts. The methods of handling this problem are by isolating the sound, using buffer zones, and special wall construction.

(5) Large music instruments should be stored on commercially-designed racks that will roll into large wall closets at the rear of the instrumental room.

214 pages. \$2.80. Mic 57-866

PREDICTING TEACHER EFFECTIVENESS OF GRADUATES OF THE STATE UNIVERSITY OF NEW YORK TEACHERS COLLEGES

(Publication No. 20,413)

Harold Jay Keeler, Ed.D. Cornell University, 1956

Chairman: Lloyd H. Elliott

The Problem

The purpose of this study was to investigate certain individual characteristics and abilities which may be of use in predicting the effectiveness of graduates of the State University of New York Teachers Colleges during their first year of teaching in an elementary school.

The Hypotheses

Ten hypotheses were postulated dealing with the relationship between teacher effectiveness and the following ten variables:

- 1. Scholastic aptitude as measured by the American Council on Education Psychological Examination
- 2. Personality as measured by the California Test of Personality
- 3. Vocational interest as measured by the Thurston Interest Schedule
- 4. Professional knowledge as measured by a specially designed test
- 5. The number of high school and college activities in which the individual participated
- 6. The number of kinds of experiences with children prior to entering college
- 7. Peer selection as measured by the number of offices to which the individual was elected in high school or college
- 8. The number of children in the family and the position of the individual in numerical order of birth
- College achievement as evidenced by the quarter of the class in which the student ranks at the time of graduation
- 10. The occupation of the father and the mother

Nine of the hypotheses listed were tested by means of the Pearson product-moment technique. One was tested by the analysis of variance.

The Appraisal Instrument

The principal instrument used in the appraisal of teacher effectiveness was developed through the cooperation of several hundred local school committees, ten state teachers colleges and the State Education Department. The instrument was used by ten experienced supervisors selected from the teachers colleges and given special training in the rating process. The effectiveness ratings were based on two half-day observations in the fall and two in the spring semester.

The Data

The data were gathered in connection with a study

carried on by the State Education Department to evaluate the emergency teacher training program which was started in 1948. The sample was composed of 110 persons selected from the June 1949 graduating classes of the teachers colleges. Representativeness was established by the chi square technique.

Conclusion

The findings tend to support the conclusion that it is impossible to predict reliably teacher effectiveness from characteristics and abilities as here measured. With the exception of one, the correlations were all nonsignificant at the five percent level. The Thurston Interest Schedule produced a coefficient of .35 when correlated with effectiveness of teachers in grades four through eight. There was no statistically significant relation between teacher effectiveness and parents' occupation as here measured.

It does not, however, seem necessary to conclude that the characteristics and abilities here studied are not important qualifications of an effective teacher. It is suggested that a knowledge of these characteristics and abilities are necessary but not sufficient for reliable prediction.

Recommendations

It is proposed that teaching is primarily a leadership role and as such is dependent upon the nature of the situation in which the teacher must function. To predict teacher effectiveness without considerable knowledge of the teaching situation is hazardous if not impossible. The deviant case analysis technique is suggested as a possible way of gaining the necessary information pertaining to the situation. The basic question to be answered is: just what is expected of the teacher in terms of classroom process and procedure and do these expectations conflict with the principles and philosophy of the teacher? Well structured interviews with both teacher and principal will provide some insight into the situation. To guard against certain idealistic statements by the principal regarding expectation, it is suggested that a teacher selected by the principal as outstanding in effectiveness be appraised by the same criteria as the teacher in the sample group. This would provide a basis of comparison between the procedures used by the teacher and the expectations of the school's administrators. 138 pages. \$2.00. Mic 57-867

PUBLIC SCHOOL LEGISLATION IN MISSISSIPPI, 1930 TO 1955

(Publication No. 19,750)

Lloyd Bowie Kite, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Erick L. Lindman

The problem of this study is to analyze public school legislation in Mississippi for grades one through twelve enacted from 1930 to 1955. The purpose of this study is to trace development of public education in Mississippi for this period as shown by all significant school legislation which was examined critically and summarized. Larger factors influencing enactment of and important changes resulting from this legislation were examined and

discussed. Historical method of research is used in making the study. Data are presented chiefly in narrative form.

This study is grouped into eight areas: state organization, county organization, district organization, pupil transportation and the school plant, the instructional personnel, the pupil, agricultural high school and vocational education, and public school finance.

Summary and Conclusions

The State Board of Education is an ex officio constitutional board consisting of three members. The state superintendent of education is a constitutional office, elective by the people. In 1946, the State Department of Education was reorganized by provision being made for six divisional heads. Free textbooks for grades one through eight were provided in 1940, and through grade twelve in 1942. The county superintendent's powers and duties were increased in 1953. The county school board consisted of five members in charge of altering school district boundaries and, in 1935, placed in charge of pupil transportation. In 1953, legislation changed this board to the county board of education, increasing their powers and duties. Seven legal types of school districts were reduced, in 1953, to three: consolidated, county-unit, and municipal separate school districts. Reorganized school districts are under the control of five trustees.

Legislation was enacted, in 1944, to enable counties to finance the purchase of school buses and to provide for their operation. During the 1930's, school districts received federal aid for school building purposes. In 1946, limited state school building aid was provided. In 1953, a state aid building program was established to equalize public school facilities.

New teacher certification laws were enacted in 1938 and 1948. Teachers are required to be certified in the areas of education in which they work. No minimum salary schedule was required for teachers until 1953 when one was enacted requiring equal pay for white and Negro teachers based on training and experience. A teacher retirement system established in 1944 was repealed in 1952. Teachers became members of the Public Employees' Retirement System, a combined social security and state annuity system.

The minimum school age of children was increased from five to six years in 1934. In 1954, a pupil assignment law was enacted, and a legal educational advisory committee was established to study all legal means for maintaining separate schools for white and Negro pupils. In 1955, the state constitution was amended to provide a method for abolishing public schools on state, county, or school district level.

After 1934-35, approximately one-half of agricultural high schools were operated in connection with junior colleges.

In 1936, the fiscal year was changed to correspond to the scholastic year, from July 1 to June 30, and a school budget law was enacted. A minimum education program supported by both state and local funds was provided in 1953. Elements of cost include: administration, current operating expenses, administrative expenses for the county superintendent's office, transportation, employers' contribution to retirement fund, and teachers' salaries. Local tax levies are authorized to enrich the minimum program.

533 pages. \$6.80. Mic 57-868

DESCRIPTION OF THE FUNCTIONS OF THE DIRECTOR OF GUIDANCE IN THE PUBLIC HIGH SCHOOLS IN NASSAU COUNTY, NEW YORK, WITH RECOMMENDATIONS

(Publication No. 19,995)

Joseph A. Kuhn, Ed.D. New York University, 1956

While research studies have investigated the duties, competencies, and training of the secondary school guidance counselor, no specific study has been made of the secondary school director of guidance. Very little material exists in the guidance literature regarding the functions of the director of guidance in the high school. Directors in the secondary schools of Nassau County, New York, expressed the need for additional information regarding their position.

The purpose of the present study is to develop a job analysis of the position of director of guidance in the public high schools of Nassau County, New York, with recommendations as to the relative importance of these functions.

The study was conducted in three parts. (1) A job analysis was made of the position of director of guidance in the high school based upon the results of personal interviews with a total of 109 principals, directors, counselors, and teachers in twenty-five county high schools cooperating in the study. This job analysis revealed the present functions of the director. (2) The guidance literature of the past seven years was surveyed for material on the director's functions. (3) The present functions of the director were then checked against those found in the literature. The resulting findings were sent, in the form of a check list, to the school personnel originally interviewed for their appraisal, utilizing a five point scale for opinion responses. A total of 101 useable returns were received. The relative importance of the director's functions, based on these responses, is then presented in order of their rank of importance.

It is possible to present only the most important findings here. A total of eighty administrative-supervisory, five counseling, and four related functions of the directors in the cooperating high schools were found to exist. Distribution of the functions varied considerably from one high school to another. Some functions were performed by practically all directors while others were performed by only a few. The most common title designating the high school guidance leader was "Director of Guidance".

The survey of the literature revealed that the director's functions were stated in very broad terms and generally represented the writers' opinions. The functions mentioned most frequently were those which dealt with the planning, organizing, supervising, administering and integrating of the guidance program. The high school guidance leader was referred to most frequently as "Guidance Coordinator".

The appraisal of the importance of the director's functions by the respondents indicated that functions concerned with the administration, supervision, planning and integration of the guidance program, the involvement of teachers in the guidance program, and the testing program, rated the highest. Functions which dealt with educational guidance rated higher than those concerned with vocational guidance.

The results of the study could provide information which may be helpful to high school administrators, high

school guidance leaders and counselor trainers. The job analysis and job description could be used by directors for self-evaluation as well as by school administrators as a guide in analysing the existing director's position or in planning the duties for a new director.

Because it appears that differences in the number of functions performed by directors vary from one school to another due to lack of agreement within the administrative and teaching staffs of the high schools as to what the guidance services should accomplish rather than to differences in school organization, the county schools should work toward a greater uniformity of their directors' functions so that a more comprehensive program of guidance services may be made available to the youth of Nassau County, New York.

283 pages. \$3.65. Mic 57-869

PROMISING PRACTICES IN SCHEDULING COCURRICULAR ACTIVITIES IN SECONDARY SCHOOLS

(Publication No. 19,755)

Paul Claude Morgan, Ed.D. George Peabody College for Teachers, 1956

Major Professor: E. L. Lindman

The purpose of this study was to investigate some of the practices which certain selected secondary schools are using for the purpose of finding time in the daily schedule for cocurricular activities, and to reveal these practices as possible guides for other high schools. General analyses were made concerning physical facilities of participating schools, the prevalence of and use of the activity period, the responsibility for scheduling student activities, problems relative to teacher sponsors and student participation in activities, and weaknesses and strengths of extraclass programs. Detailed analyses were made of the methods which participating institutions employ for scheduling activities involving all students simultaneously, for scheduling activities involving special interest groups, and for scheduling activities involving class and home room groups.

Findings of the Study

General findings revealed that 70 per cent of the participating schools include an activity period in their schedule, and that 59 per cent of those providing for this period do so on a daily basis. Fifty-three per cent of the institutions scheduling an activity period find a time and place for this period between 10:00 A.M. and 12:00 noon. Responsibility for scheduling activities varies widely, with eleven different individuals and groups assuming this duty in the various reporting schools. Primary barriers to securing the needed number of teacher sponsors for activities are overloaded teachers, uninterested teachers, and untrained teachers.

Self-evaluations by cooperating institutions revealed the chief weaknesses of their cocurricular programs to be a lack of trained and interested sponsors, lack of pupil interest and participation, and insufficient time in the school day. Strong points of the extraclass programs of these institutions, according to their evaluations, are an activity period during the school day, and a wide variety of cocurricular activities.

The assembly is the activity involving all students simultaneously which is common to the most schools, 100 per cent of the institutions engaging in this activity. Methods of scheduling activities involving all students include activity periods, assembly periods, rotating class periods, and home room periods.

Special interest activities analyzed include athletics, clubs, music, student government, and student publications. Athletics, generally speaking, are not participated in on an interscholastic basis during school hours, but are practiced during physical education periods, class periods, and a special events period. Clubs are scheduled during lunch periods, activity periods, rotating class periods, and after-school hours. Regular class periods, vacant periods, lunch periods, activity periods, and after-school hours are used for music activities. Student government activities take place during home room periods, activity periods, rotating class periods, and after-school hours. Work on student publications is accomplished during English classes, journalism classes, vacant periods, library periods, activity periods, and after-school hours.

Class activities are scheduled during rotating class periods, activity periods, home room periods, assembly periods, and after-school time. Home room activities take place during check-up and extended home room periods, activity periods, stationary class periods, rotating class periods, and out-of-school time.

Each institution, although employing several scheduling techniques, was found to rely primarily upon one basic method. The basic methods employed are: the activity period; the home room period; the rotating class period; the alternating schedule; the period obtained by shortening class periods; and out-of-school hours.

318 pages. \$4.10. Mic 57-870

THE SHARED INCOME TAX AND SCHOOL SUPPORT IN WISCONSIN

(Publication No. 18,431)

Joseph Magnus Nygaard, Ph.D. The University of Wisconsin, 1956

Supervisor: Dr. Russell T. Gregg

I. The Problem

Considerable controversy centers around the question of how the shared income tax is related to the financial support of public schools in Wisconsin. Some people contend that under the present plan of distribution the shared income tax tends to work against adequate school support. Others insist that by relieving the burden on local property for municipal purposes increased potential for greater school support is created. The problem for this study, therefore, is to examine the extent to which the shared income tax is related to the financial support of public schools in Wisconsin.

II. Procedure

Two groups of Wisconsin cities, comparable in terms of population, were selected. One group was composed of

19 cities that received high per capita shared income tax returns ("high-group" cities), and the other group was composed of 19 cities that received low per capita shared income tax returns ("low-group" cities). The two groups of cities were compared with respect to (1) property tax rates for municipal, for school, and for all purposes, (2) local taxpaying ability, and (3) the level of expenditures for municipal and for school purposes. In addition, a group of 20 Wisconsin cities was compared to a group of 20 Minnesota cities with respect to the level of expenditures for municipal and for school purposes. Minnesota cities were included because Minnesota is a state with higher state aids to school districts, and much lower state payments to municipalities for municipal purposes than Wisconsin.

Eight hypotheses concerning the relationships of the shared income tax and school support in Wisconsin were tested. Four of the hypotheses were concerned with how the amount of shared income taxes received related to property tax rates, one with how the amount of shared income taxes received related to the principle of equalization, and three with how the amount of income taxes received related to the current expenditures of the 38 cities and the 38 school districts.

III. Results

The mean equalized property tax rate for municipal purposes was 4.26 mills for the high-group cities and 6.61 mills for the low-group cities in 1954. During the same year the mean equalized property tax rate for school purposes was 9.92 mills for cities of the high group and 12.90 mills for cities of the low group.

The average equalized property valuation per capita in 1954 for cities of the high group was \$4960; for cities of the low group it was \$2326. The average per capita shared income tax return in 1955 for cities of the high group was \$25.88; for cities of the low group it was \$6.74.

Current expenditures for municipal purposes per capita in 1954 was \$46.09 for the high-group cities and \$32.16 for the low-group cities. Current school expenditures per pupil for the 1954-55 school year were \$300.46 for the high-group cities and \$270.10 for the low-group cities.

Current municipal expenditures per capita in 1954 were \$41 for 20 Wisconsin cities and \$34 for 20 Minnesota cities. Current school expenditures per pupil for the 1954-55 school year were \$286 for the 20 Wisconsin school districts, and \$305 for the 20 Minnesota school districts, in which the cities were located.

IV. Conclusions

1. The shared income tax constitutes an important part of the total revenues available to cities that receive high income tax returns for municipal purposes; it is less important to the cities that receive low returns. As a result, the shared income tax provides the high-group cities with nearly twice the property tax relief (in terms of the mill rate levy for municipal purposes) that it provides the low-group cities.

2. Cities that receive high shared income tax returns have lower average property tax rates for both municipal purposes and for school purposes than cities that receive low income tax returns. Furthermore, in cities which receive high income tax returns the average tax rate for school purposes is lower to a greater extent than is the average tax rate for municipal purposes. Thus, the prop-

erty tax relief provided by income tax receipts for municipal purposes does not result in a higher tax rate for school purposes.

3. The shared income tax plan violates the principle of equalization because the cities with the greatest local taxpaying ability receive the largest per capita amounts of shared income taxes.

4. High shared income tax receipts and high expenditures for municipal and school purposes tend to go together.

- 5. Cities that receive high shared income tax returns spend more for both municipal purposes and school purposes than cities that receive low returns; however, the relative difference in school expenditures between the two groups of cities is greater than the relative difference in municipal expenditures between the two groups of cities. Thus, high shared income taxes favor municipal services over school services.
- 6. Cities in Wisconsin that receive high shared income tax returns have a higher level of current expenditures for municipal purposes than cities in Minnesota that receive low income tax returns; cities in Minnesota that receive high state aids for education have a higher level of current expenditures for school purposes than cities in Wisconsin that receive low state aids for education.

227 pages. \$2.95. Mic 57-871

PUBLIC RELATIONS RESEARCH CONCERNED WITH PUBLIC ELEMENTARY AND SECONDARY SCHOOLS

(Publication No. 19,759)

Robert Jefferson Pearson, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Willard Goslin

The purpose of this study is to analyze and summarize research studies in the field of public school public relations, and to integrate the important findings of the studies. The report includes fifty-one periodical articles, research reports from twenty-seven books and yearbooks, two mimeographed reports, and 120 unpublished doctoral studies.

Each research report was examined to determine the purpose of study, scope of study, research methods used, data gathering instruments used, findings of the study, and the strengths and limitations of the method of investigation. Extensive notes were made of the findings of each study. These findings were synthesized in the body of the report, and a brief summary of each research report was included in an Appendix.

Sixty per cent of the research studies in public relations have been made during the ten years prior to 1955. Recent research has emphasized the areas of public opinion, lay participation, and the role of specific agents in public relations. Practically all studies used the methods of survey or analysis, or a combination of these methods. The questionnaire was the most frequent instrument used to gather data. However, many studies used other instruments or "no instrument."

Public relations research reveals considerable difference between the expressed beliefs of professional personnel regarding public relations, and the extent to which the beliefs have been put into practice. Adequate means have not been developed for the appraisal of programs or for evaluating specific activities in an objective manner. Survey type studies have been concerned mainly with what was being done, with little effort made to determine the effectiveness of what was being done.

Based upon the research findings, it is recommended that the following steps be taken to improve public relations: policies, guiding principles, and long and short range purposes and plans should be cooperatively developed and adopted; more objective methods should be used in evaluating public relations programs and activities; the role of the agents of public relations should be clearly defined; further experimentation is needed in the use of radio, movies, and television; and simplified methods for determining citizens opinions and understanding of schools should be used.

Recommendations for future research included: continued exploration of the areas of lay participation, the role of different agents, and the formation and determination of public opinion; the development of more adequate means for evaluating programs and activities; and exploration of the formation of citizens attitudes, opinions, and beliefs about schools.

385 pages. \$4.95. Mic 57-872

A STUDY OF THE SUNDAY SCHOOLS OF THE NATIONAL EVANGELICAL LUTHERAN CHURCH

(Publication No. 19,064)

Frank J. Pies, Ed.D. Wayne State University, 1956

Adviser: Roland C. Faunce

To the National Evangelical Lutheran Church, a Protestant church body, the Sunday school is an important institution. It is so because the Sunday school is an agency through which the church educates its members and through which it contacts additional people for membership. The church is therefore interested in developing the Sunday school into the best possible kind of educational institution.

In order to accomplish this goal, a periodic and systematic study of the Sunday school system seems necessary. Up to the time of the study described in this dissertation, no such activity had been carried on in the 54 year history of the National Evangelical Lutheran Church. It was therefore decided by the writer to choose the Sunday schools of the National Evangelical Lutheran Church as the topic for his dissertation.

the topic for his dissertation.

After the consent and co-o

After the consent and co-operation of the members of the National Evangelical Lutheran Church to conduct the study had been acquired, three questionnaires were developed. One questionnaire was designed for the staff members of the Sunday school, one for the parents with children currently enrolled in the Sunday school, and one for the children of the Sunday school. The purpose of the questionnaire was to discover the present situation in the Sunday schools of the National Evangelical Lutheran Church and to determine what the people wanted their Sunday Schools to be like. The following is a summary of the questionnaire responses.

1) Responses to the section of the questionnaires devoted to goals toward which the people want their Sunday school to be working reveal that twelve goals are desired by the three groups questioned. These goals deal with the areas of knowledge, attitudes, and skills. Not any of these desired goals are currently being accomplished with complete satisfaction.

2) Responses to the section of the questionnaires devoted to the subject of Sunday school teaching methods reveal that current teaching methods used in the Sunday school are the kind which give attention to the acquisition of knowledge, but give little or no attention to the develop-

ment of desirable attitudes and skills.

3) Responses to that section of the questionnaires devoted to the subject of the Sunday school teacher reveal that present teachers do not possess enough of the knowledge, attitudes, and skills needed to work effectively with a teaching method through which consideration for all desired goals can be given.

4) Responses to the section of the questionnaires devoted to the subject of the Sunday school superintendents indicate that they possess some knowledge, attitudes, and skills needed to be democratic leaders but that further

development along these lines is desirable.

5) Responses to that section of the questionnaires devoted to the subject of the physical plant of the Sunday schools of the National Evangelical Lutheran Church indicate that further development and change need to be brought about in the physical plant of the Sunday school if the kind of program which will take into consideration all the desired goals is to be carried on.

The responses indicate a strong desire on the part of all concerned to have the Sunday school program so developed that desired goals may be given consideration. It is therefore recommended that all groups concerned cooperate in planning and working together toward that end. Suggestions for improvement, upon the basis of recent developments in the field of general education, in the various areas under consideration are made in the chapters. It is further recommended that desirable changes be made in a manner which will not develop insecurities in people.

The dissertation closes with four suggestions for future studies in regard to the Sunday school and its program.

219 pages. \$2.85. Mic 57-873

TENNESSEE'S PUPIL TRANSPORTATION PROGRAM: HISTORICAL BACKGROUND, ANALYSIS, AND RECOMMENDED PROCEDURES

(Publication No. 19,760)

Charles Kenneth Pullen, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Willard Goslin

The purpose of this study was to determine and evaluate pupil transportation practices in the public schools of the State of Tennessee, and to set forth suggestions for improving those practices. The historical background of pupil transportation in the United States and in Tennessee were developed. A detailed analysis of the pupil

transportation program in Tennessee, for the school years 1937-38, 1946-47, and 1953-54, was made. The analysis was based on such factors as costs, distances, equipment, policy determination at the state and local levels, driver selection and training, auxiliary uses of school buses, safety practices, and control and management of the pupil transportation program. Criteria for evaluating a pupil transportation program were developed from professional writings in the field. Policies and practices in effect in Tennessee were compared to the criteria developed from the authorities in the field.

Findings of the Study

The first pupil transportation law was enacted in Massachusetts in 1869. The pupil transportation movement spread slowly until 1900. From 1900 to 1920, the pupil transportation movement spread rapidly to all sections of the United States. The most rapid growth of the movement has occurred since 1924.

The first reported pupil transportation in Tennessee was in 1910. A statewide pupil transportation law was enacted in Tennessee in 1913.

Pupil transportation in Tennessee was a local responsibility until 1938 when the first state aid for transportation was granted. In 1947, the state assumed the major responsibility for financing pupil transportation, and the program was included in the Tennessee Minimum Foundation Program for Education.

The State of Tennessee, through the State Department of Education, has met many of the standards established in the criteria. However, the State has failed to meet criteria standards in the areas of records, record analysis, and driver training.

A number of county boards of education and county superintendents of schools in Tennessee have done an excellent job in meeting the criteria standards for the operation of a pupil transportation program. A majority of the county boards have failed to meet criteria standards in the areas of policy development, school bus routing procedures, driver employment and training, cost records, accounting procedures, and purchase methods.

The pupil transportation program in Tennessee compares favorably with the total program in the United States on the basis of costs, loading of buses, and growth of the program.

Tennessee's pupil transportation program, in 1953-54, showed a favorable comparison to the pupil transportation programs of twelve Southern states on the basis of per pupil costs, size of the program, number of pupils transported per bus, and the per mile costs of school bus operation.

The Tennessee State Department of Education and the several county boards of education in the state should plan cooperatively to improve the pupil transportation program in several areas. Planning is needed in the areas of driver employment and training, reduction of school bus loads, reducing pupil riding time, record keeping and analysis, and purchase methods. 361 pages. \$4.65. Mic 57-874

AN ANALYSIS OF FACULTY PERSONNEL POLICIES IN SELECTED COLLEGES OF SOUTH CAROLINA

(Publication No. 19,785)

Prezell Russell Robinson, Ed.D. Cornell University, 1956

The Problem

The general purpose of this study was to identify, analyze and appraise those faculty personnel policies in operation at the institutions which participated in this study, which seemed to have a significant relationship to faculty growth and development. Specifically, the problem was: (1) to identify existing faculty personnel policies in selected colleges of South Carolina; (2) to analyze and appraise these policies in light of significant trends as revealed through a review of the literature; and (3) to offer suggestions and recommendations commensurate with what appear to be sound policy and practice prevailing in the field.

Method of Investigation

The first step in this study consisted of a comprehensive review of the literature in the field and the identification of those factors and working relationships which seemed especially concerned with faculty security, growth and development.

In reviewing the literature, studies were used mainly that would:

- 1. Be representative of the judgment of qualified scholars in the field.
- 2. List a wide variety of institutions according to type, function, accreditation standards and geographical location.
- 3. Be objective in approach and appraisal.
- 4. Set forth evaluations that would serve as guiding principles in the present study.

Following a review of the literature and consultation with several authorities in the field of faculty personnel administration, the following faculty policy areas were decided upon for investigation and analysis: (1) faculty selection and appointment; (2) faculty tenure, rank and promotion; (3) leaves, turnover and salary; (4) insurance and retirement benefits; and (5) conditions of work and welfare services.

On the basis of the criteria established for participation in the investigation, there were fourteen institutions of higher learning in South Carolina which took part. Included among these were five liberal arts colleges attended predominantly by females; two essentially all-male liberal arts colleges; five co-educational liberal arts colleges; a state university and one Land Grant college.

Conclusions

The data from this investigation seem to justify the following conclusions:

- 1. Commendations seem to be in order to the reporting institutions for the progress they appear to be making in strengthening their faculty policies.
- 2. The average institution in its search for faculty personnel is rather certain to use the services of college or university placement bureaus and the recommendations

from qualified individuals in the field for which an appointment is made.

- 3. Appointing officers at a typical college will consist of the president, the dean and the departmental head in which the appointment is being made.
- 4. The outstanding factors that largely influence appointments are teaching ability, degrees held, and character and personality traits of the teacher.
- 5. All teachers, regardless of rank, must expect to serve some form of probation before being granted tenure.
- 6. Faculty promotions in rank appear to evolve largely around teaching effectiveness, length of teaching experience and degrees held.
- 7. Teachers may expect to be dismissed for proven incompetence and moral turpitude.
- 8. The majority of the institutions provide leaves of absence for professional improvement but with little or no financial assistance.
- 9. A teacher is much more likely to tender his resignation at a church-related or private, nondenominational college for strictly financial reasons than at a state-supported institution.
- 10. When a faculty member becomes ill, the chances are reasonably certain that if he is employed at a church-related or private, nondenominational institution, consideration in his case will be handled on an individual basis. If he is employed at a state-supported institution, there is more likely to be a formal policy in operation.
- 11. Highest average salaries are paid by the statesupported and private, nondenominational colleges. Salaries are lowest at denominational colleges.
- 12. In general, it seems that too few administrative officers and teachers who need clerical assistance are provided it.

 248 pages. \$3.20. Mic 57-875

A STUDY OF THE ADMISSION VARIABLES USED IN THE SELECTION OF CANDIDATES FOR THE DOCTORAL PROGRAM OF THE SCHOOL OF EDUCATION OF THE UNIVERSITY OF PITTSBURGH

(Publication No. 18,259)

Stanton Wayne Simkins, Ed.D. University of Pittsburgh, 1956

In studying the admission variables that are used in the selection of doctoral candidates in the School of Education of the University of Pittsburgh, the writer has attempted to prove or disprove that there exists a positive and significant relationship between the admission variables and selected criteria of success. The admission variables considered in this study are as follow: the University of Pittsburgh Examination, the undergraduate quality-point average, the graduate quality-point average at the time of admission to the doctoral program, personal references, and an oral examination before a committee of the graduate faculty in the School of Education.

The above-mentioned admission variables were studied in terms of certain criteria that characterize the successful doctoral student. The four criteria of success selected for use in this study are as follows: a dissertation-rating index, the final quality-point average, the research quality-point average, and the general comprehensive examination results.

Two separate groups of doctoral students were used throughout the study for the purposes of comparison. One group included graduate students who had been admitted to the doctoral program after the University of Pittsburgh Examination was required as an admission variable but who have since been labeled by definition as terminated students. The other group included graduate students admitted to the doctoral program under the University of Pittsburgh Examination requirement who have pursued the doctoral program to successful completion, receiving either the Ph. D. or Ed. D. degree. The terminated group numbered 93 students and the degree or successful group included a total of 104 students.

Group means were calculated for each admission variable as recorded by the terminated students and were compared with corresponding group means for the degree students. The degree students were further divided into Ph. D. and Ed. D. degree groups for purposes of comparison. The "t" test of significant difference was applied to comparable groups of mean scores.

The University of Pittsburgh Examination appears to be able to discriminate between terminated students and successful degree students. When terminated students were compared with degree students the undergraduate quality-point variable was unable to discriminate between the two groups. The graduate quality-point average proved to be discriminating but the reference rating variable failed to discriminate between the terminated and degree students. When terminated and successful degree students are compared on the basis of whether or not the student is required to take an oral examination, there appears to be no significant difference between the student's oral examination experiences and his final status as a successful or terminated student.

The combining of the three University of Pittsburgh Examination subtests by regression techniques for prediction purposes does not indicate any advantage over the prediction capacity of the total University of Pittsburgh Examination battery stanines that are the result of averaging the individual stanines of the three subtests. A maximum multiple correlation of .66 was the result of combining the undergraduate quality-point average, the University of Pittsburgh Examination, and the graduate quality-point variables. 188 pages. \$2.45. Mic 57-876

CURRENT TRENDS IN THE ADMINISTRATION OF THE READING PROGRAM

(Publication No. 19,763)

Lawrence Russell Stewart, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Arville Wheeler

The purpose of this study was to reveal some of the most recent practices in the administration of the reading programs in cities of the eleven states comprising the Southern Association of Colleges and Secondary Schools regional area that have a population between 25,000 and 50,000. This study provides a method of evaluating particular programs of reading in the light of established criteria. The criteria were developed from a study of current literature and subjected to a jury of reading specialists for their evaluation and approval.

The literature examined was classified under the following eight broad categories: (1) reading readiness, (2) beginning reading, (3) primary reading, (4) reading in the intermediate grades, (5) reading in the junior high school, (6) reading in the senior high school, (7) remedial reading, and (8) general information regarding reading.

In order to discover the most recent practices in the administration of the reading program, a questionnaire was sent to each of the superintendents in the fifty cities referred to above. Answers were received from forty-two, or 84 per cent of the school systems. Personal visits were made to six of these school systems.

Findings of the Study

This study showed that most pupils entering the first grade have a period of reading readiness experiences before being introduced to formal reading.

Leading authorities in the field of reading agree that a mental age of about six and one-half years represents the optimum time in which to learn to read. Most of the respondents indicated this belief and practice in their schools.

Initial reading instruction approaches vary all the way from an outright basal-reader approach to an all-out experience or interest approach. In teaching beginning reading emphasis is placed upon reading techniques, devices, and the development of reading skills. It is the Learn how to read period.

The stimulation of the child's growth in fundamental reading habits is emphasized in the primary reading stage in the second and third grades.

In the intermediate grades the pupil is taught to establish ability and independence in identifying strange printed words, increase his demand for meaning and power in coping with meaning difficulties, and develop the skill and interest necessary in reading a wide variety of materials in many different fields.

Studies conducted by competent educators indicate that from 10 to 30 per cent of the secondary school students are not reading on a level generally expected of normal children at that age. This study also indicated that unfortunate condition. This finding indicates the need for more emphasis on reading and for remedial reading instruction.

Teachers have a large part in the selection of supplementary books, library books, and textbooks. The training of teachers for reading instruction includes: attendance in college and summer schools, attendance in in-service training programs, and attendence in special reading clinics and workshops.

The most common method of grouping children for reading instruction is grouping within a grade with flexible methods being practiced. All the forty-two school systems practice grouping within a grade.

Beginning formal reading is delayed for each child until the teacher believes he is likely to succeed.

Phonetic instruction is introduced in the first grade and continued in all other grades. Phonics is taught as a word perception or recognition technique.

Evaluation of reading is chiefly effected by a series of achievement and other tests, and by the teachers' records of pupils' work.

The determining factor of promotion is the pupil's ability to profit by the promotion. Some children are retained, however, to place them in their best learning situation.

266 pages. \$3.45. Mic 57-877

THE ASSEMBLY IN PUBLIC HIGH SCHOOLS IN THE UNITED STATES

(Publication No. 19,766)

James William Whitlock, Ed.D. George Peabody College for Teachers, 1956

Major Professor: E. L. Lindman

This study purports to trace the historical development of the high school assembly; to determine present assembly practices in the nation's public high schools; and to evaluate present conditions in the light of established criteria of acceptable high school assembly practice. Data for tracing the historical development of the high school assembly and for establishing criteria of acceptable assembly practice were secured from available literature. In order to determine present assembly practices, a questionnaire was sent to 493 high school principals selected at random from the forty-eight states and the District of Columbia. Three hundred eighty-nine, or 79 per cent, of the questionnaires were filled out and returned.

Findings of the Study

The high school assembly has been characterized by two distinct phases of development. The "chapel period" began with the academy and remained a part of the earlier high school. By 1920 it became evident that the assembly was changing its emphasis in many high schools. From the earliest stage, when the programs were of a sermonic and moralizing type, the assembly passed by 1935 into a more advanced stage where the keynote was student participation. It is in this stage that a large majority of the high schools in this study remain today. In a small percentage of present-day high schools a third stage is developing. This stage is one of audience participation where an effort is made to have the entire audience participate actively in the program.

The divergence of opinion regarding the purposes of the high school assembly, existent through every phase of its development, remains in the present. Its unifying quality and its efficacy in stimulating interest in all phases of the school program are considered most important by those participating in this study.

A comparison of the findings of this study with the 1946 nationwide survey of assembly practices conducted by the National Association of Secondary School Principals reveals little change in the status of the high school assembly since that time.

In light of criteria developed in this study for evaluating assembly practices, certain strengths in the present program of many schools can be noted. Practices are characterized by a lack of uniformity. Schools are adapting procedures to their individual needs. Assembly periods approximating class periods in length are scheduled often enough to maintain interest but not too often to preclude necessary planning and preparation. Joint responsibility for planning and presenting a wide variety of programs is being effected through a central committee made up of pupils and teachers. Programs are planned in advance and proper balance between the assembly and other phases of the school program is maintained. Those responsible for planning the assembly are keeping its social and educational values foremost in mind. The principal, although aware of his assembly responsibility, remains in the background.

Certain weaknesses are also evident. The effectiveness of the program is limited by the physical inadequacy of assembly rooms, by lack of teacher training in the supervision of assembly activities, and by a failure to provide assembly funds in the regular school budget. Time for planning, rehearsing, and presenting programs is being provided by methods other than a regularly scheduled activity period. Undue emphasis is being placed on the stage and its performers to the neglect of actively involving the audience. Discipline during assembly is effected by rigid faculty control. Few schools are making proper use of the assembly as a public-relations device and little effort is being made to evaluate the effectiveness of the programs presented.

243 pages. \$3.15. Mic 57-878

THE ENACTMENT OF A STATE SCHOOL PROGRAM IN TENNESSEE

(Publication No. 19,767)

Bob J. Womack, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Truman M. Pierce

The purpose of this study is to examine and evaluate the processes by which a state educational program is formulated and enacted into law in Tennessee. Emphasis is placed upon identifying and examining certain forces which tend to exert influence on the state school program.

Collection and Treatment of Data

The first step in this study was the development of the roles of certain agencies, in and out of government, believed to be influential in the formulation and enactment of state school policy. Among the agencies considered were the three branches of Tennessee state government, the Tennessee Legislative Council, the State Department of Education, and the Tennessee Education Association. The roles of these agencies were developed by examining the provisions under which they gain their authority.

Through a study of democratic principles, criteria were developed by which the Seventy-Ninth General Assembly's legislative processes could be evaluated.

The remainder of the data contained in this study concerns the formulation and enactment of state school policy by the Seventy-Ninth General Assembly.

Information was sought regarding the method employed in the formulation of proposed school policy by the specific agencies considered in this study. The school policies recommended by specific agencies were followed as they were introduced to the Seventy-Ninth General Assembly, and an attempt was made to analyze the factors which influenced the outcome of those proposed policies.

The final aspect of this study is devoted to evaluating the activities which determined the state school program enacted by the Seventy-Ninth General Assembly.

Summary of Findings

1. The recommendations of the Tennessee Legislative Council were the most influential presented to the Assembly.

- 2. The Tennessee Education Association and the state administration effected compromises considered beneficial to both.
- 3. Organized rural legislators can dominate the activities of the Tennessee legislature.
- 4. There were indications that the Tennessee Legislative Council was an extension of the executive branch of state government, instead of an independent investigative body.
- 5. Leadership in government, during the Seventy-Ninth General Assembly, used the interpretation of information as a force in molding legislative opinion.
- 6. The State Department of Education in Tennessee was sometimes placed in an awkward position since it represented a political administration as well as the profession of education.
- 7. Factors other than the merits of proposed legislation affect the votes of some legislators.

Conclusions

- 1. Revenue bills receive more attention from legislators and the public than the policies which the bills finance.
- 2. In the majority of cases, the legislator voted what he considered the sentiments of those he represented.
- 3. Legislative procedure, outlined in the Tennessee Constitution, was followed by the Seventy-Ninth General Assembly without exception.
- 4. The individual legislator was primarily interested in his district.
- 5. All agencies concerned with the development of state school policy spent much time and effort to gain information necessary to make intelligent decisions.
- 6. Compromise is necessary in formulating and enacting a state school program.

Recommendations

- 1. Any organization wishing to improve the state school program in Tennessee through legislative action should first convince the voting public that the improvements are worthy of support.
- 2. The Tennessee Education Association should explore new techniques in working with legislators on the local level.
- 3. All state school legislation must be interpreted to the voting public as it affects the children.
- 4. There should be a reorganization of the representative aspect of the Tennessee Education Association.
- 5. There should be a closer working relationship between the Tennessee Education Association's Representative Assembly and Administrative Council.
- 6. Citizens in Tennessee should be led to a thorough understanding of the role of education in the present American society.
- 7. The agencies that formulate public school policy should be free from political control or interference.
- 8. Tennessee should reapportion its representatives and senators. 291 pages. \$3.75. Mic 57-879

EDUCATION, AGRICULTURAL

SUGGESTED PRODUCTION GOALS FOR FARM ENTERPRISES IN LOUISIANA

(Publication No. 17,450)

Thomas Jackson Stanly, Ph.D. Louisiana State University, 1956

Supervisor: Dr. J. C. Floyd

This study is concerned with establishing suggested production goals for farm enterprises studied in vocational agriculture. The scope of this problem is delimited geographically to the State of Louisiana. It includes twenty-one of the top twenty-five farm enterprises in the state based on contribution to farm income.

In the treatment of data concerning this problem, goals, aims, and purposes are used interchangeably. For the purpose of determining production goals in this study, the following five points are developed: the relationship between goals and the learning process, the factors concerning the production of a farm product which are indicative of efficiency of production, the current efficiency standards of these efficiency factors, suggested production goals, and the approved practices recommended for the attainment of production goals.

The efficiency factors, efficiency standards, production goals, and selection of the most important approved practices were established by specialists of the Division of Agricultural Extension at Louisiana State University.

The efficiency standards and production goals established by these specialists are studied estimates. The approved practices most important to the accomplishment of the production goals were also selected by these men. The approved practices that are generally carried out by the majority of farmers are not included in this problem.

In this study, the portion treating the establishment of efficiency factors, efficiency standards, and production goals did not lend itself to summarization. Therefore, the summarizing and concluding statements deal primarily with purposes and uses of production goals in teaching and studying vocational agriculture.

It was concluded that the changing nature of our civilization is constant. As a result, our educational system must prepare the student adjustment in a modifying environment. For our educational system to be successful in this effort, its activities must be in accord with worthwhile goals. Furthermore, goals supplement the learning process. Goals are better adapted for use by the teacher and student when stated in terms of student accomplishment. Interests of the student are stimulated by the use of goals. Use of production goals in connection with the student's farming program will increase the effectiveness of the program as an aid to learning. In addition, this use of production goals will provide a means of evaluation of the learning activities of the student.

The production goals presented in this study were based on the point of highest profit combination. Each goal was established on a statewide basis, except where the production of the product was distributed throughout the state resulting in a significant difference of production per acre due to varying soil types. In these instances, the state was divided into soil type areas which were treated individually. These production goals are intended to serve

only as guides for setting up individual goals for farm enterprises included in the student's farming program. The availability of suggested production goals will increase their use in teaching vocational agriculture. As a result, instruction in vocational agriculture will be made more effective.

218 pages. \$2.85. Mic 57-880

EDUCATION, PHYSICAL

AN EVALUATION OF THE TWO YEAR REQUIRED PROGRAM OF PHYSICAL EDUCATION FOR MEN AT EMORY UNIVERSITY, GEORGIA

(Publication No. 19,736)

John Chellman, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Solon B. Sudduth

The Problem

The two year required program of physical education for men at Emory University has been in effect in its present form since 1946. In view of the projected needs of the student, four primary purposes of the program were formed. An evaluation was made in order to determine whether the program was meeting these four purposes.

If the purposes are not being realized, then modifications in the program are necessary in order to better meet the needs of the student. Also the evaluation should show the factors that affect the required program at Emory University. This, then, was the dual purpose of the evaluation.

Procedure

A random sample of Emory graduates was taken until one hundred replies were received. All the participants had graduated from 1949 through 1954, had taken the two year requirement in physical education, and were practicing their various vocations.

The critical incident technique was used as the method of research. All information was mailed to the graduates and they responded in written form. The information received provided a functional description of specific behaviors which made the program most effective or least effective for each individual.

By using the category formulation method of classification, all behaviors were placed in an outline. This outline contained 5 major areas, 26 sub-areas, 49 classes, and 141 categories. Accurate analysis of these data resulted in the formation of certain conclusions pertaining to the required program of physical education at Emory University.

Conclusions

The conclusions showed that the required program of physical education at Emory University was successfully meeting three of its four purposes. In the area of physical conditioning, proper attitudes and carry-over values, the program in its present form is doing an adequate job. Its

strongest characteristic is in the area of carry-over sports. It is not adequately meeting the purpose of improving personal health practices and the development of proper health practices in others.

The following areas include the primary factors affecting the required program of physical education for men at

Emory University.

1. Diversity of the Program

It is evident from the results obtained that an effective program must include a rich selection of activities.

2. Staff

The number of staff members and the quality of their work play an important part in the acceptance of the program and the benefits derived therein by the students.

3. Carry-Over Values

The program should include a variety of carry-over activities which the student will continue after college days are over. Experiences in the program resulted in many related values important in other phases of life. Social maturity and self-confidence were mentioned here.

4. Curriculum

A successful program should include team sports, individual and dual sports, conditioning work, and effective classification tests.

5. Facilities

Facilities should be ample enough to offer a variety of activities to all of the participants.

6. Flexibility of the Program

A sound program should be sufficiently flexible so that it may make proper adjustments to care for the atypical students, the students of low motor ability, and the highly skilled students.

7. Physical Conditioning

Although some conditioning work is done in the various activities, there is a need for more conditioning for all students regardless of the activity. The need is especially apparent in the team sports.

205 pages. \$2.70. Mic 57-881

A PHILOSOPHICAL ANALYSIS OF THE SPIRITUAL AND MORAL VALUES IN CAMPING

(Publication No. 19,992)

Josephine W. Hubbell, Ph.D. New York University, 1956

This study poses as a problem for consideration the realization of spiritual and moral values in the daily living experiences of the child at summer camp. The purpose of this work is to offer a philosophical analysis and solution to this problem.

A review of the literature within the field of education as it relates to spiritual and moral values and of the published writings in the area of organized camping reveals three factors pertinent of the study.

- Spiritual and moral values have been generally accepted as an integral part of the teachings of the schools.
- 2. Camping is beginning to assume a more important role in the total education of the child.
- 3. Little emphasis has been placed upon camping as a

specific and important area within the realm of education for developing spiritual and moral values.

The investigator has used the documentary method of research as a means of gathering necessary material for the pursuit of the study. Sources have been limited because there are not at the present time a great many educators who have written in the areas of spiritual and moral values or camping. However, careful effort has been made to select as source material only those writers who have gained recognition particularly in the fields of religious education and those who are the acknowledged leaders in the camping field.

The investigator has constructed a two-fold foundation for the development of the problem. One part has been the selection of criteria for identifying spiritual and moral values. The other part has been a delineation of camp function in all of its ramifications as it applies to the organized summer camp. Building upon this is a consideration of the qualities and abilities requisite in leadership for reaching the child's potential for realizing spiritual and moral values. It is then pointed out in what ways these implications for realizing spiritual and moral values in education can be transposed into the camp situation.

In order to bring this realization of spiritual and moral values in camping to a practical and practicable level, certain human qualities such as truth, honesty and responsibility which are inherent in a code of spiritual and moral values are described. It is then shown in what ways the practice of these qualities or guiding principles can be brought directly into various specific situations that are indigenous to organized summer camping. These are the ways, and means, then, for utilizing the camp as a specialized agent of education for the greater development of a realization of spiritual and moral values in the thoughts and actions of children.

This last -- the offering of tangible ways in which those who are charged with leadership in camp can bring about an awareness of and an appreciation of those more tangible spiritual and moral values on the part of the youngsters -- is the solution to the problem.

From the above considerations this important conclusion has been reached. Camp is a relatively undeveloped area for the realization of spiritual and moral values. It is nevertheless an area with an excellent potential for such realization and development. Therefore, it may be said that the summer camp is a rich source of untapped opportunities for the further guidance of youth and offers a significant challenge to those in the field of camping.

168 pages. \$2.20. Mic 57-882

A STUDY OF HIGH SCHOOL GIRLS' INTERSCHOLASTIC BASKETBALL IN TENNESSEE

(Publication No. 19,747)

Jean Gillis Jacobs, Ed.D. George Peabody College for Teachers, 1956

Major Professor: S. B. Sudduth

The Problem

The purpose of this study was to analyze Tennessee's program of interscholastic basketball for high school girls

and to recommend a course of action for the future. To achieve this purpose the following was presented: (1) an overview of the national situation in regard to interscholastic basketball for girls; (2) an analysis of the existing program of interscholastic basketball for girls in Tennessee high schools; (3) a study of the legal aspects and allocation of authority pertaining to basketball on state and local levels; (4) an examination of the position of teachertraining institutions of Tennessee relative to the rules used in training officials, and sources of qualified women coaches available for high school coaching positions; (5) a comparative study of the two sets of rules used within the state by colleges and secondary schools.

Method and Procedures Employed

The descriptive method of research was employed with the textual and tabular modes of presentation. Data gathering devices used included the following: a study of related literature, an examination of state athletic records, a check list to determine practices in girls' basketball, personal interviews with college training personnel, letters to authorities, and a study of the two sets of rules used.

Findings

Eleven of the forty-eight states have very specific regulations prohibiting girls' interscholastic basketball. Nine additional states prohibit interscholastic basketball, while a number of other states follow a policy of discouragement. Eleven states sponsor state basketball tournaments.

Secondary schools of Tennessee use Girls National Basketball Committee (GNBC) rules while the majority of the teacher-training institutions use National Section for Girls and Women's Sports (NSGWS) rules. Rules and policies are set up for girls' athletics without counsel or representation by women physical educators.

Three hundred and ten high schools of Tennessee have girls' basketball teams; sixty-three do not. Thirty-seven have women coaches. The basketball season extends from four to six months, with 97.2 per cent of the teams playing two games per week, and practicing three or more times a week. Approximately 600 officials for girls' games are needed each week. Men officials are used for all games.

Recommendations

Two courses of action are recommended in the order of preference:

1. Abolish girls' interscholastic basketball and concentrate on sound instructional programs accompanied by adequate intramural programs for all girls. Urge that the state of Tennessee employ a full-time woman physical educator to be vested with authority to direct a state-wide physical education program for girls based on girls' rules, standards and policies endorsed by the American Association for Health, Physical Education, and Recreation.

2. The second course of action recommended is to retain interscholastic basketball under the following considerations: use girls' rules, policies and standards as endorsed by the American Association for Health, Physical Education, and Recreation; use women coaches and officials whenever possible; empower the state athletic association, the state supervisor of physical education, and women physical educators to share joint responsibility in

maintaining suggested standards; limit the maximum number of games to twelve, plus one tournament, with practices limited to a maximum of three per week; play only one game per week on a time other than a school night; limit the length of the season; separate girls' games from boys' games; place heavy emphasis on establishment of higher standards in officiating; urge the Tennessee State Department of Education to insist that women physical educators be in charge of girls' physical education and sports.

Only by a definite, concentrated effort to bring about changes in present practice will the best interests of the girls who participate in interscholastic basketball be assured.

121 pages. \$2.00. Mic 57-883

FACTORS AFFECTING RELIABILITY OF MEASURES OF MOTOR PERFORMANCE

(Publication No. 19,111)

Marie Rose Liba, Ph.D. The University of Wisconsin, 1956

Supervisors: Professors Ruth H. Glassow and Arvil S. Barr

The purpose of this study was to investigate particular sources of unreliability in velocity measures of motor performance. Possible factors affecting reliability were regarded as: 1, factors in the observation process, including the skill of the observer and the accuracy of the stop watch; 2, factors related to the stability of the performance of subjects both within and between days; 3, factors related to the method of scoring; and 4, factors related to the level of ability of performers.

The measures of motor performance were measures of the velocity imparted to a ball in four different skills; tennis forehand and backhand drive, overhand softball throw and bowling. In addition, a special set of data representing the timing by different observers using different watches of a shuttlecock dropped from four heights was collected to provide evidence on equipment variability and further evidence on observer variability. The main statistical method was analysis of variance. In addition, in the timing study the direction and amount of deviation from several estimates of true time were determined and the velocity data were also analyzed by correlation methods.

Over the range of intervals used in the timing study, the error of observation tended to be similar for the four time intervals. The error of observation appears to be relatively constant and not a function of the interval to be timed and is a greater percentage of short interval times than of longer interval times. Thus, the coefficient of variation for this source of error tends to be negatively correlated with the time interval. This was also found to be true for the velocity measures.

For the five observers used in the timing study there were apparent systematic differences in the accuracy of observation. This finding was supported by several different analyses of the data. Observer differences were also significant in the velocity measures but the magnitude of these differences was relatively small. Observer

differences, measured by correlation coefficients, were not significantly different on the two days, over the six trials or for subjects of different ability levels, but were different for three measures, lower for the tennis drives than for bowling.

For the watches used in the timing study, one of the seven watches employed appeared to be responsible for the significant difference in means with the other watches giving similar mean times. Thus, watch variability does not appear to be a major source of error in the measurement of velocity.

For the velocity measures, within day reliabilities were slightly higher than comparable between day estimates for both average and best method of scoring one or more trials. Day differences were significant in all of the measures but the magnitude of these differences was small. Average scores for a given set of trials were found to be slightly more reliable than best scores but the best and next best method of scoring was more reliable than either average or best and particularly so for the tennis measures. The Spearman Brown formula was found to overpredict but the differences in predicted and computed estimates were small. Reliability estimates computed from three methods of scoring were found to increase with an increase in the number of trials. It was found that reliability estimates differed for the four skills; the striking skills were less reliable than the throwing skills. Trial differences were significant in bowling but not in softball or the tennis measures. The findings in the study of differences in reliability for different levels of ability were for the most part difficult to interpret. There was no consistent pattern favoring either the high or low group, except in the correlation data for the two observers and in the latter differences in reliability were accounted for to a considerable extent by differences in variability in the

This study suggests that a feasible procedure for gathering velocity measures in various skills can be designed for use in ordinary class situations. Such measures should be of use in the instruction of students in activity classes and in the evaluation of the effectiveness of instruction which is designed, in part, to assist students to achieve a satisfactory level of velocity. The observations of two trials should give an adequately reliable measure in bowling or softball using any one of three methods of scoring. However, for the tennis measures, using best and next best scoring procedures, at least six trials would be necessary to yield an adequate estimate of reliability. Observations on velocity measures could be recorded on one day and for tennis and softball any of the trials in a sequence could be observed whereas for bowling the trials selected must be done so with recognition of the systematic shift in means. Finally, this study suggests that although observers appear to be different the correlations between observers are substantially high and the magnitude of differences between the means of observers is relatively small. Thus the observations of one observer would probably be adequate. 307 pages. \$3.95. Mic 57-884

COMPETITIVE ATHLETICS IN THE ELEMENTARY SCHOOLS OF DAVIDSON COUNTY, TENNESSEE

(Publication No. 19,754)

Johnny Jerome Miller, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Solon B. Sudduth

The Problem

The problem of competitive athletics in the elementary schools has been of great concern to the school officials of Davidson County, Tennessee. As a result of the recommendations of the Joint Committee on Athletic Competition for Children of Elementary and Junior High School Age and of other local factors, the Davidson County Board of Education issued a regulation to the school administrators which banned the playing of tackle football on an interschool basis.

The action concerning the football program was rescinded in January, 1955, after protests from many of the parents. The Davidson County Board of Education left the decision to the individual schools as to whether they would support competitive athletics.

Several members of the Joint Committee recommended that research be made in specific areas confronted with the problem before action be taken concerning elementary school athletics. It was the desire of the examiner to investigate the existing practices in competitive athletics in the fifty elementary schools of Davidson County, Tennessee.

Procedure

The principals and teachers of the fifty elementary schools of Davidson County were interviewed through the use of a checklist standardized by the Educational Policies Commission. The checklist measured the extent to which the individual schools followed the recommendations and also the extent to which the principals and teachers agreed with these statements.

An attitude scale constructed by the writer from the recommendations of the Joint Committee and the Educational Policies Commission and developed according to the Likert Method, was mailed to 10 per cent of all parents of sixth, seventh, and eighth grade children. Sixty-four per cent of the parents or 318 responded to the scale.

Conclusions

The attitude scale items were weighted to offer a score range from twelve to sixty. The scores of the parents ranged from sixteen to fifty. The mean score of the group was 31.51, and the standard deviation was 5.92. A chisquare test of normality of the distribution was calculated. A chi-square value of 2.13 enabled the writer to accept the hypothesis that the scores from the scale were normally distributed. The calculated population mean at the .05 level of confidence was between the limits of 30.85 and 32.15. Tests were also computed to show that parents with previous athletic experience were more in favor of interschool sports than were those without such experience. According to the checklist data, certain practices of the programs of athletics differed from the recommendations of the Educational Policies Commission in the following respects:

- 1. Most of the schools were lax in their physical examinations of athletes.
- 2. Few schools offered a written policy regarding financial responsibilities for injuries.
 - 3. Few schools had adequate facilities for athletics.
- 4. Only fourteen schools followed the recommendation that competitive athletics should not be played below the ninth grade.

Eighty per cent of the teachers and the same number of principals favored some form of interschool athletic competition. Forty-four per cent of the teachers and 76 per cent of the principals did not consider tackle football a desirable activity for elementary school children. Fiftytwo per cent of the principals and 32 per cent of the teachers did not approve of basketball for girls.

Sixty-one per cent of the parents favored tackle football, and 88 per cent of the parents favored basketball for girls on the interschool basis.

As a result of this study, it seems reasonable to accept all but one of the recommendations of the Joint Committee and the Educational Policies Commission. The data indicate that it is possible and sometimes desirable to have a sound interschool athletic program below the ninth grade. 155 pages. \$2.05. Mic 57-885

A STUDY OF PHYSICAL EDUCATION TEACHING COMPETENCIES NEEDED BY ELEMENTARY CLASSROOM TEACHERS: AS APPLIED TO THE STATE UNIVERSITY TEACHERS COLLEGE POTSDAM, NEW YORK

(Publication No. 19,997)

Simon J. Molnar, Ed.D. New York University, 1956

The Problem

The purpose of the study is to determine those competencies needed by classroom teachers who teach physical education in elementary schools under the supervision of the specialist in physical education; to determine the extent to which these competencies are being provided in the total curriculum of elementary education at the State University Teachers College Potsdam; and to determine those areas of the curriculum where these competencies can be upgraded.

Procedures

The data needed for the study were obtained in two ways. First, desirable experiences in physical education for elementary-school-age children were identified and validated through literature sources in elementary education, physical education, and child development. These experiences were used as a basis for identifying classroom teacher competencies needed for teaching physical education in elementary schools. The competencies were then validated through literature study and jury techniques. A framework, outlining classroom teacher functions in physical education, was also applied to ascertain the completeness of the listing.

The second procedure used in collecting the data involved a study of the elementary education curriculum at Potsdam. Questionnaires were submitted to all faculty

members who teach courses in the required curriculum. The data from these questionnaires showed the extent to which each course, and subsequently the total curriculum, contribute to the development of each of the competencies. A second questionnaire was then submitted to the same faculty members. The purpose of the second questionnaire was to determine which of the courses in the curriculum could provide additional experiences to help upgrade the competencies needed for teaching physical education.

Findings

The results of the study show that physical education activities offer nine types of desirable experiences for elementary-school-age children. Each of these experiences contributes in some measure to the basic needs of children.

Thirty-five competencies were identified and validated as being needed by classroom teachers who teach physical education. Of these, eleven are designated as being of a general nature in that they apply to all areas of teaching. Twenty-four other competencies are considered to be of a specific nature in that they are needed primarily for the teaching of physical education subject matter.

It was noted that the curriculum places greater emphasis upon those competencies which are of a general nature than upon those which are of a specific nature. With the exception of three instances, however, all of the competencies, including those of a specific nature, can be upgraded to some extent without changing the nature and purpose of the present curriculum.

Conclusions

It was felt that the curriculum shows particular weakness in providing for twenty-three of the thirty-five competencies. All of these pertain primarily to the physical education area of teaching. The competencies which are of a general nature appeared to be provided for in a satisfactory manner. It was also felt that the twenty-three weaker competencies could not be improved to a satisfactory degree without changing the nature and purpose of some of the courses in the present curriculum.

Recommendations

Recommendations were made suggesting closer coordination between the physical education department and those areas of the curriculum where competencies can be upgraded. A second recommendation suggests that changes in the present curriculum be made on the basis of apparent value to classroom teachers in providing the best experiences for elementary-school-age children. It was recommended that the opinion of experienced teachers, graduates of Potsdam, be surveyed to determine the value to them of the various curriculum areas studied in undergraduate preparation. Such a study might help determine a more comprehensive and practical interpretation of desirable curriculum practices in elementary education.

403 pages. \$5.15. Mic 57-886

THE RELATIONSHIP OF MEASURES OF SELF CONCEPT, MOTIVATION AND ABILITY TO SUCCESS IN COMPETITIVE ATHLETICS

(Publication No. 18,946)

Francis Ford Pyne, Ph.D. University of Minnesota, 1956

It is generally accepted that success in competitive athletics, as in most fields of endeavour, demands a certain minimal level of ability. The investigation takes cognizance of the role of ability and attempt to determine the significance of the relationship between measures of certain selected psychological characteristics and athletic success.

The population consists of the varsity basketball squads from selected high schools in the Minneapolis city and lake conferences for the playing season 1955-56.

Five variables are considered and six measuring instruments are utilized. Motivation is measured by two different methods. The n Achievement test, developed by McClelland and associates, is a projective technique scored for motivational content. A Motivation Rating Scale was designed to measure motivation in terms of observable behavior. Self Concept as a person is measured by a Self-Rating Inventory developed by Brownfain. Self Concept as a player is measured by a rating scale designed to measure the player's concept of how well he is able to perform the component skills of the game. Aspiration is measured by a rating scale designed to measure the player's concept of the level of success toward which he is striving, his athletic aspiration. Ability is measured by a rating scale designed to rate the player's ability in terms of fourteen component skill areas. All instruments were administered before and after the regular conference playing

The basic design embodies the principle of replication. Null hypotheses are postulated to test the relationship between each of the variables and levels of success. The relationship between the variables and the separate squads is also tested. The analysis of variance and covariance by means of least squares analysis are the primary statistical tools. Analysis of covariance is used to determine the value of the five measures in differentiating between success groups after initial differentiation is made on the basis of ability.

The analysis of results showed significant differences to exist between successful and unsuccessful players, as groups, on certain of the characteristics studied. The following conclusions were drawn: (1) It is possible to differentiate between successful and unsuccessful players, as groups, on the basis of their ability, motivation as measured in terms of observable behavior, self concept as a player and level of aspiration; (2) It is not possible to differentiate between successful and unsuccessful players, as groups, on the basis of their motivation as measured by the n Achievement test and their self concept as a person. Successful players rate higher than unsuccessful players on those variables which show a significant difference.

A secondary purpose of the study was to determine the effectiveness of the n Achievement test as a measure of athletic motivation. This test did not differentiate between criterion groups. A subsidiary analysis showed a complete lack of correlation between the n Achievement test and the Motivation Rating Scale, both of which purport to measure motivation.

The analysis of covariance indicated that if one measure was to be selected as indicative of ultimate success, that measure would be ability. When the variables are adjusted for ability, differences between criterion groups are eliminated. It appears that ability incorporates the predictive power of the other variables and adds something of its own. Whatever the operating factors may be the best single indicator of eventual success is ability.

Stringent limitations must be observed with regard to the populational and situational generalizability of the results of the investigation. It is believed that the investigation points out the merit of further research concerning possible commonalities among top level athletic achievers in terms of psychological characteristics and the contribution of these characteristics to athletic success.

312 pages. \$4.00. Mic 57-887

A STUDY OF FACTORS CONTRIBUTING TO THE DEVELOPMENT OF GENERAL MOTOR SKILL

(Publication No. 19,762)

William Edward Smith, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Solon B. Sudduth

The purpose of this study was, through inquiry into the past experiences of freshmen at North Carolina State College, to determine those factors that have influenced their level of general motor skill. In order to isolate the factors or elements affecting the student's level of motor skill, many sources of possible influence were examined. Twenty-one factors were set up in hypotheses and analysed to determine if they had or had not influenced the motor-skill development of the students studied. In addition four sub-problems were examined.

Findings of the Study

The subjects used in this study were three hundred students from the freshman class at North Carolina State College. As the subjects made up three representative groups of the freshmen class, the conclusions from this study are regarded as valid for the entire class.

The findings of this investigation indicate that socioeconomic background, intelligence, the elementary school physical education program, size of graduating class, father's encouragement toward taking part in sports activities, home environment, wearing corrective glasses, scholastic rank, type of home community, and the influence of brothers and sisters, may not be assumed to be factors influencing the development of general motor skill.

It appears that certain factors encourage the development of general motor skill. These are body type, health, the junior high-school physical education program, the senior high-school program of physical education and athletics, physical education credits in grades nine through twelve, physical education marks in grades nine through twelve, community influences, and non-directed participation in play and sports activities.

It seems that certain factors also act to hinder the development of general motor skill. These limiting factors are emotionality, domination by the mother, and embarrassment when showering or dressing with others.

The findings from the four sub-problems indicate that the boy's greatest area of interest is dating. Sports participation is the second most popular area of interest, with hunting and fishing, and radio, television, and movies ranked third and fourth. The most pronounced difference in interest between boys of different motor-skill levels is in sports participation. The high-skilled boy is most interested in playing sports. The boys of low motor skill did indicate a definite interest in sports, however.

The most popular sports with these college boys in order of preference are basketball, football, baseball, swimming, tennis, fishing, and bowling. Boys of high motor skill differ from boys of low motor skill most on football, basketball, bowling, badminton and track. The high group showed higher interest than the low group in football, basketball, and track; the low group showed higher interest than the high group in bowling and badminton.

The students feel that the influences that have most encouraged their general motor-skill development are related to the community, school, and home and family. They believe that having to work has been the most active force in limiting motor-skill development. Other forces that they feel are preventing this development are associated with home and family, school, health, community, and other interests.

199 pages. \$2.60. Mic 57-888

A COMPARATIVE STUDY OF SOCIALIZATION IN PHYSICAL EDUCATION DUE TO CLASS ORGANIZATION

(Publication No. 19,355)

Leonard Arthur Yates, Ed.D. University of Houston, 1956

Statement of the problem. It was the purpose of this study to compare, by means of personal distance ratings, personal-social group adjustment of seventh grade boys enrolled in physical education classes of Woodrow Wilson Junior High School of Port Arthur, Texas, from September, 1955, through March, 1956, when organized on the basis of homeroom grouping, sociometric data, and McCloy's Classification Index.

Methods and procedure. A seven month period of time was required for completion of the study. A sociometric instrument, the Classroom Social Distance Scale, was used to determine acceptance by the group and the individual's feelings toward his group. Time for becoming acquainted with class members was allowed in the situation. The Classroom Social Distance Scale was administered on two occasions, once in September, 1955, and again in March, 1956.

This investigation followed the social adjustment, as measured by the Classroom Social Distance Scale, of three methods of grouping students for participation in physical education activities. Homeroom membership was the criterion on which the control group was organized. All students in a given homeroom were placed in the same squad for play and competition. The squads remained constant throughout the study with the exception of those students

who were dropped from or enrolled in the squads after the beginning of the study.

Sociometric techniques were used with the group organized on the basis of data gathered from these techniques. This group was known as the sociometric group. The members of this group were allowed to choose those with whom they would like to play. The students were told they would perhaps not be with all of their chosen companions, but they would certainly be with some of them. Each student was allowed three choices of teammates. The squads organized in this manner were subject to changes for each new activity in the program.

McCloy's formula, 20 (age) plus 6 (height) plus weight, was used as the criterion for organization of squads in this group. Generally, the boys with the higher index numbers were the larger boys in the group. Students were assigned on the basis of their index numbers with the larger boys in one squad, the next largest boys in another squad, and so on.

In addition to the data furnished by the Classroom Social Distance Scale, data furnished by the class records were used to indicate how the groups compared on the basis of final marks for the course, days absent, days without proper equipment, and from the Classroom Social Distance Scale the number of rejects, and votes under the last two columns on the Scale. Subjective observations by the members of the instructional staff were also recorded as another means of comparing the groups.

Summary of the findings. It was possible to measure social group growth of the groups under investigation with the use of the Classroom Social Distance Scale. This instrument was economical of time and expense and the technique of its employment is relatively simple. The technique of having the members of the group write the names of their classmates in the left hand column was considered an aid in getting the groups acquainted. The instructor would call the name of the student and have him stand. All members of the group would get an opportunity to look at him. While he was standing, the instructor would spell his name for the group.

It was concluded a more accurate method of determining feelings toward others was needed. The self social acceptance score was determined from the responses on only one child, resulting in an individual rating.

The group organized on the basis of sociometric data seemed to make more progress toward group cohesion than did the McCloy group and control group. Subjective ratings by the instructors rated the sociometric group superior in group spirit, social climate, ease of control, and in cooperation with the instructor.

Improved social relationships were noted in the sociometric group more so than in the other groups. The number of rejects and near-rejects within the sociometric group was reduced to a greater extent than in the other groups.

There is a possibility class organization along sociometric lines may contribute to better attendance in the physical education class. There is also a possibility this method of organization favorably influences members to dress for participation in physical education activities.

The data obtained from the use of sociometric techniques may help the instructor to increase his understanding of pupil behavior. This may aid the instructor in helping those individuals who are experiencing difficulty in adjusting to the group.

Further research is needed in this area of physical education. Research that would cover a longer period of time might provide the data necessary to establish minimum acceptable social standards of social adjustment in order that instructors can evaluate their efforts at socialization.

113 pages. \$2.00. Mic 57-889

EDUCATION, PSYCHOLOGY

A STUDY OF INTERRELATIONSHIPS BETWEEN MEASURED SATISFACTION WITH COLLEGE AND CERTAIN ACADEMIC AND PERSONALITY VARIABLES

(Publication No. 19,193)

Kermit Odell Almos, Ph.D. University of Minnesota, 1956

The Problem. There is some evidence that institutions of higher learning could achieve their goals more effectively if more were known about the reactions and perceptions which students have concerning their college experiences. A knowledge of factors which disturb students could help identify situations that are in need of change and could prove valuable to counselors desirous of assisting students in the achievement of their goals and the development of self-understanding.

The primary purpose of this investigation is to study differences between groups of "satisfied" and "dissatisfied" male college freshmen on selected ability, personality, and achievement variables. Satisfaction is defined in terms of scores on the Roy College Satisfaction Index.

The Sample. The subjects were 725 male freshmen (93 per cent of the total) who entered the University of Minnesota, College of Science, Literature and the Arts in the fall of 1953 and completed that school year or terminated without enrolling in another college. It was shown that the mean college entrance score of the 725 subjects was not different from that of students who had entered the College of Science, Literature and the Arts from 1949 - 1952.

Procedures. The College Satisfaction Index contains scales on curriculum, instructors, social life on campus, professional counseling, faculty advising, opportunities for cultural development, health service, living quarters, and college in general. The Index was mailed to the subjects after the school year 1954 had closed. Returns suitable for use in the study were received from 88 per cent of the students. Responding and non-responding students had similar mean scores on age and the A.C.E. The mean scores of the non-responding students were significantly lower at the .01 level on high school rank, grades, and the Ohio State University Psychological Test. Scores on the first eight scales of the Index were summed to obtain a measure of the student's over-all satisfaction with college. After comparing the satisfaction scores of this population with norm data obtained in an institution of comparable size, the variables of quarters in school, stated educational objective, scores on the MMPI, college ability tests, type of residence occupied, age and grades were examined with respect to total satisfaction scores. Students scoring high

and low (upper 10 per cent and lower 10 per cent on total score on <u>Index</u>) were labeled "satisfied" and "dissatisfied," respectively and compared on the above variables.

The tests of significance made to permit statistically acceptable conclusions were the t, F, Behrens-Fisher test, analysis of variance, and Zubin's test for percentage differences. The Hoyt method was used in estimating reliability of the Index.

Summary and Conclusion.

- 1. The male freshmen of this study had the mean score on each scale of the College Satisfaction Index falling within Gamelin's category of "mild satisfaction."

 This pattern was not significantly different from a similar population reporting on the same instrument in 1951.
- 2. Students who remained enrolled longer had higher total satisfaction scores. This tendency was corroborated in a follow-up.
- 3. "Satisfied" students were more like extroverts (at the .01 level) on the "Si" scale of the MMPI than "dissatisfied" students.
- 4. "Satisfied" students had lower mean scores at the .05 level of confidence on the Depression scale of the MMPI than "dissatisfied" students.
- 5. The "satisfied" students had higher mean ability scores and made better grades at the .05 level of confidence than "dissatisfied" students.
- 6. The mean score on the <u>Index</u> for students with two or more scales above 70 on the MMPI showed that these subjects were no more dissatisfied with college life than students whose personality profiles were more normal. 195 pages. \$2.55. Mic 57-890

AN EXPERIMENTAL STUDY OF A STRUCTURED INTERVIEW FOR DETERMINING VOCATIONAL INTERESTS

(Publication No. 19,609)

Fred Gartin Armstrong, Ed.D. Temple University, 1956

The main purpose of this study was to develop a structured interview technique for the determination of vocational interests. This involved five major steps:

- 1. A review of the literature to determine the existence of previous and current, related studies.
- 2. Development and publication of an Interviewing Work Sheet and accompanying Card-Pack to facilitate the structured interview technique.
- Selection of interest tests to provide an established, standardized basis for evaluating the interview procedure.
- 4. Administration of three interest tests and completion of the structured interview (with sound recording) for one hundred cases to determine the general validity of the technique.
- 5. Analysis of the data obtained.

II. SUMMARY

1. Most attempts to assess expressed interests have employed simple devices such as check sheets, or have utilized the counselor's later subjective analysis of the interview to arrive at expressed interests.

2. Few systems for determining vocational interests have attempted to encompass the entire occupational structure or have attempted to reduce interests from general groups to specific choices in an orderly procedure.

3. Most attempts to correlate expressed with measured interests have found a limited relationship, with coefficients of the order of +.50.

4. The structured interview technique described in this study is the first to provide for the counselee a systematic description and examination of virtually the whole occupational world, for the counselor a related recording device, and for both, the opportunity to utilize most of the advantages of unstructured counseling.

5. Determination of the relationship between primary and secondary expressed interests as determined by the structured interview technique and primary and secondary interests as measured by three tests produced the following results:

| EXPRESSED INTEREST | MEASURED INTEREST | COEFFICIENT OF CONTINGENCY | CORRECTED COEFFICIENT |
|--------------------|----------------------|----------------------------|-----------------------|
| Primary | Primary | +.73 | +.84 |
| Secondary | Secondary | +.47 | +.54 |
| Primary | Secondary | +.37 | +.43 |
| Secondary | Primary | +.32 | +.38 |

III. CONCLUSIONS

Within the limitations of the scope of the present study the following conclusions may be drawn.

It has been demonstrated that it is possible to devise a structured interview technique for the determination of vocational interests which approximates the results obtained by the testing of interests. More important, the system, in its flexibility, permits a near normal counseling procedure whatever one's philosophy of counseling, since interruption of the ordered process is possible at any time. A unique feature of the system, in contrast to most interest testing and techniques of counseling, is the provision for a comprehensive survey of virtually all occupations, as listed in Part IV of the Dictionary of Occupational Titles. It is not intended that this structured interview technique should replace interest testing; rather, it is a supplement to testing. It is intended as an aid to the counselor who wishes his counselee to explore more fully the occupational world before making interest based choices.

The structured interview technique, even when coupled with interest testing, is not a total answer. Experience with this new counseling tool has raised questions and revealed problems which may well become the subjects of future research.

113 pages. \$2.00. Mic 57-891

PREDICTION OF ACHIEVEMENT IN NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

(Publication No. 20,405)

Parviz Chahbazi, Ph.D. Cornell University, 1956

The purpose of this study was to investigate the prediction of academic achievement in the New York State College of Agriculture at Cornell University. Achievement was predicted on the basis of four paper-and-pencil tests, an orientation inventory, secondary school averages and two projective tests.

In Part I of the study, the sample consisted of 813 New York State College of Agriculture students at Cornell University, freshmen entering in September, 1951, 1952, and 1953. The secondary school averages of these students and their scores on the Cooperative Reading Test, Cooperative Science Test, Cornell Mathematics Test, and Ohio State University Psychological Test were used to predict their first-term college averages. Validities and intercorrelations were computed for the secondary school average, the first-term college average, and the score on each of the four tests. From these data, a multiple regression equation was derived for predicting first-term average with a coefficient of multiple correlation of 0.536.

On the basis of this regression equation, first-term averages were predicted for all the 813 students. If the actual first-term average of a student was greater or less by five or more points than the first-term average predicted for him, he was called an "over-achiever" or an "under-achiever" as the case might be. The responses made on the Cornell Orientation Inventory by these two groups were then analyzed for each item by counting the number of responses made by members of each group to each of the five choices possible in every item.

Fifteen of the thirty-two items on the Cornell Orientation Inventory produced low probabilities on the chi-square tests of significance. A partial score was computed for all the 813 students, scoring only the items which produced low probabilities on the chi-square tests. These partial scores were then correlated with the criterion and with the five prediction variables used to derive the first regression equation. From these correlations and intercorrelations, beta weights and regression weights were obtained for each prediction variable and a second regression equation with a coefficient of multiple correlation of 0.569 was derived.

In Part II of the study, in addition to the five predictive variables used in developing the first regression equation and the Cornell Orientation Inventory, two other tests, the Picture Stimuli Test and the Sound Stimuli Test, were added to the battery. In the Picture Stimuli Test a picture of a young American musician was projected on a screen. In the Sound Stimuli Test a recording of a symphony was played. In both of these test situations, the students were asked to write what they thought was going on in the mind of the musician. No time limit was set for either test.

The tests were scored by computing the n Achievement score specified by McClelland as Scoring System C in The Achievement Motive. These scores, the scores on the four aptitude and achievement tests, the partial scores on the Cornell Orientation Inventory, and the secondary school

averages of 224 freshmen entering in 1955, were used to predict their first-term college averages.

From these data, the third regression equation was developed with a coefficient of multiple correlation of 0.633 when all the eight predictive variables were included in the battery, compared to a coefficient of multiple correlation of 0.512 when the two achievement motivation tests were excluded and only six predictive variables were used. The F-value for the difference between these two coefficients was significant at the 1% level.

98 pages. \$2.00. Mic 57-892

THE EFFECT OF WRITTEN ORIENTATION
MATERIAL UPON CLIENT SATISFACTION WITH
THE INITIAL VOCATIONAL COUNSELING INTERVIEW

(Publication No. 19,813)

Leonard Edwin Dodson, Ph.D. University of Illinois, 1956

This investigation was designed to test the hypothesis that use of a printed orientation booklet would contribute significantly to client satisfaction with the initial counseling interview. Agreement of client perception of the actual counseling relationship and perception of an ideal counseling relationship was used as the working definition of satisfaction. The actual and ideal scores were obtained from the same sixty items using appropriate directions for each perception. For each item a seven-point Likert type rating scale was used. There were twelve items descriptive of each dimension (psychological characteristics of a counseling relationship), i.e., the dimensions of Communication, Status, Security, Emotional Distance and Responsibility.

All groups were treated alike except the experimental groups read the Orientation Booklet. A second control and experimental group was used where the usual oral orientation was not given prior to the interview. All clients received the usual vocational counseling as provided by a Veterans Administration Guidance Center.

The Orientation Booklet was approximately 1500 words in length, or six minutes reading time. Readability was estimated to be at the seventh to eighth grade level. The content (illustrations, photographs and context) was an attempt to summarize Veterans Administration policy and procedures in vocational counseling.

Veteran clients were assigned at random to either the control or experimental groups. The four groups were comparable in age, education and number of dependents, although the two control groups had more dependents than Korean veterans nationally.

Total satisfaction scores (sum of the five standardized dimensional scores) were submitted to analysis of variance. No significant difference was indicated between (1) control and experimental orientations, (2) counselor groups, or (3) client types (i.e., average, submissive or independent in typical interpersonal relationships as judged from TAT stories). Each dimension was submitted to analysis of variance and the interaction between counselors and orientations was significant in the dimension of Responsibility (for direction and content of the interview). The t-test of all possible combinations of means showed a

significant difference (and in the direction predicted) between groups receiving only oral orientation and those receiving both oral and booklet orientation with respect to satisfaction with client-counselor sharing or responsibility.

The following conclusions seemed tenable:

- 1. No significant improvements in total satisfaction with the initial interview is obtained by use of an orientation booklet.
- 2. Client satisfaction with the client-counselor responsibility for direction and content of the initial interview is increased for clients of some counselors if they have read an orientation booklet.
- 3. The orientation booklet is effective in producing increased client satisfaction in the dimension of Responsibility only when used with a brief oral orientation.

 77 pages. \$2.00. Mic 57-893

A STUDY OF THE RELATIONSHIP BETWEEN VARIABILITY IN PHYSICAL GROWTH AND ACADEMIC ACHIEVEMENT AMONG THIRD AND FIFTH GRADE CHILDREN

(Publication No. 19,090)

Gerald Thomas Gleason, Ph.D. The University of Wisconsin, 1956

Supervisor: Associate Professor Herbert J. Klausmeier

This study was designed to test two hypotheses:

- 1. Variability in physical growth is accompanied by variability in academic achievement.
- 2. Variability in physical growth is accompanied by low academic achievement.

Variability was defined as an index of irregularity in five physical growth measures---height, weight, strength of grip, dentition, carpal development---or in three achievement measures---reading, arithmetic and language.

The subjects were 54 third-grade and 66 fifth-grade children enrolled in four classrooms of two elementary schools. The subjects' mean chronological age was below the means in height, weight, strength, mental development, and achievement in reading, arithmetic, and language. Seventy-five per cent of the children had fathers in professional or managerial occupations. It was assumed that the physical growth characteristics and school achievements of these normally developing, healthy children were similar to those in children of like parental occupation.

Measures of height, weight, strength of grip, dentition, carpal development, mental maturity, and achievement in reading, arithmetic and language were obtained for each of the classroom groups during a one-week period. The reliability checks performed indicated that the scores obtained were reliable. Correlation coefficients obtained between the reading test used and other reading tests and with teacher judgments of pupil achievement showed satisfactory validity for the purpose of testing the hypotheses.

In treating the data, all raw scores were converted to "z" scores with the subjects grouped by grade and sex. For each subject, a mean physical z score, an index of

physical variability, or the sum of the deviations from the mean physical z score, a mean achievement z score, and an index of achievement variability were computed.

In addition, in view of the low and inconsistent correlations observed between dentition and the other physical measures, a mean physical z score and an index of physical variability were computed excluding dentition. Also, a mean achievement z score including the mental maturity test score was computed.

In testing the first hypothesis, correlations were obtained between physical variability and achievement variability, including and excluding dentition and mental age, for third-grade boys, third-grade girls, fifth-grade boys, fifth-grade girls, total boys, total girls, total third grade and total fifth grade. Of the 32 correlations obtained, 2 were significant within the five per cent level of significance; 18 were in the hypothesized direction, and 14 were opposite to the hypothesized direction. Distinct sex differences were noted with 16 of 16 correlations for girls in the hypothesized direction and 14 of 16 correlations for boys in the opposite direction. The hypothesis that physical variability is accompanied by achievement variability was considered rejected.

To test the second hypothesis, the index of physical variability, including and excluding dentition, was correlated with the mean achievement z score, including and excluding the mental test score. Of the 32 correlations obtained, 2 were statistically significant and 28 were in the hypothesized direction. A second test of physical variability being accompanied by low achievement was made by comparing the mean achievement of high physical variability and low physical variability groups, using a "student's t" test. Of 8 "t" values, one was significant. In every instance the mean achievement of the high physical variability group was lower than the mean achievement of the low physical variability group. Thus, both tests led to the rejection of the hypothesis using the 5 per cent level of significance.

The rejection of these hypotheses raises questions concerning the concept of unity of growth since variability was in evidence as well as consistency. However, a replication of the present study is needed with groups more representative of all occupations or a random sample of a larger population in order to clarify the somewhat inconsistent results obtained with respect to sex differences and the marked tendency for high physical variability to be accompanied with lower achievement.

167 pages. \$2.20. Mic 57-894

A STUDY OF THE DISCREPANCIES BETWEEN
INSTRUCTOR GRADES AND TERM-END EXAMINATION
GRADES AMONG BASIC COLLEGE STUDENTS AT
MICHIGAN STATE UNIVERSITY

(Publication No. 20,208)

Eldon G. Kelly, Ph.D. Michigan State University, 1956

The purpose of the investigation was defined as an attempt to discover how those Basic College students who consistently received a higher grade on the common departmental term-end examinations than they received from their instructors differed from those students who consistently received the higher grades from their instructors than they received on the term-end examinations.

Two groups of students, called the "higher instructor grade group" and the "higher examination grade group," were selected on the basis of consistent deviations between instructor and term-end examination grades. The higher instructor grade group consistently received the higher grade from their instructors, while the higher examination grade group repeatedly received the higher grade on their term-end examinations. There were fourteen males and fifteen females in the higher instructor grade group and twenty males and twelve females in the higher examination grade group. These students were juniors and almost all of them had completed all of the Basic College courses.

The author hypothesized that the consistent differences between instructor and examination grades among students in the two extreme groups were non-random phenomena related to specific, measurable variables.

The Findings. The mean Inventory of Beliefs score of the higher instructor grade group was found to be significantly lower (beyond the .01 level of confidence), characterizing this group as the more compulsive, rigid, conforming, and authoritarian.

The mean ACE score of the higher instructor grade group was found to be significantly lower (beyond the .01 level of confidence) than that of the higher examination grade group. A similar relationship was found between the two groups on scores obtained on the Michigan State University Reading Test.

The mean instructor grades of the two groups were strikingly similar. However, the mean examination grade of the higher examination grade group was B plus while that of the higher instructor grade group was C minus.

Interview data showed the higher instructor grade group to be more anxious, threatened and insecure. The higher examination grade group appeared to be confident about their ability to perform and unalarmed about their consistently lower instructor grades.

Conclusion. On the basis of the evidence obtained, the following conclusion is presented: Consistent deviations in the direction of either higher instructor grades or higher term-end examination grades were to a considerable extent a function of personality traits, or affective factors. This is to say that the group of students who were characterized as being more conforming, compulsive, rigid, and authoritarian received higher grades from their instructors than would be expected of them on the basis of ability alone, while the higher examination grade group was capable of receiving higher grades from their instructors than they did.

Recommendations. The author recommends that the relative importance of the ability and personality factors be clarified with reference to the higher instructor grade group and that a more thorough and definitive approach be made to investigating the personality factors involved in the problem with respect to both groups.

71 pages. \$2.00. Mic 57-895

DEVELOPMENTAL TASKS: MIDDLE ADOLESCENT PEER CULTURE TASKS AS OBSERVED IN TWO SELECTED ENVIRONMENTS, A HIGH SCHOOL AND A COMMUNITY YOUTH CENTER

(Publication No. 18,361)

Robert Botts Kluge, Ed.D. University of Houston, 1956

This study was conducted to determine how well thirtyone students in two selected enrivonments, a school and a
community center, were achieving two developmental tasks
related to peer group behavior. The two tasks, I Achieving
New and More Mature Relations with Age Mates of Both
Sexes and II Achieving a Masculine or Feminine Social
Role, were elaborated by means of behavior trait descriptions of what a well adjusted sixteen year old would exhibit.

Research began with information found in the school files, observations of the pupils and answers from a student questionnaire, Growing Up Socially, administered in January and June of the school term. This information was compared with a questionnaire, A Check Sheet for Appraisal of Peer Group Behavior, filled in by teachers and sponsors of the Beehive in January and again in June.

The results of the Check Sheet were placed on individual Personality Trait Sheets for each pupil. Trait medians from the individual Personality Trait Sheets were then combined into group results. The results of the first and second semesters were compared to see if there was any growth or change in behavior traits or tasks.

Group Findings

Trait One, "Two or more mutual friendship choices," in Task I was placed in the medium stage of development the first and second semesters. Trait Three, "Chosen by peers for some responsible position in club, committee or team," and Trait Eight, "Has one or more functional roles recognized by the clique groups," were the only traits to change from the medium stage of growth or development to the high stage of development. All other traits in Task I and Task II were rated as high development for the period of the study.

The basic principles of human growth and development were observed in the peer group behavior of the thirty-one students included in this study. The basic principles related to developmental tasks presented by Aydelotte were drawn upon as a framework for presentation of these data.

Conclusions

1. It became clear that individual students have individual needs and problems that must be met and solved in an individual way. 2. Each individual has a different growth pattern. 3. Much of the social growth and development takes place outside of the school and should be considered by the school. 4. Outside activities provide the best environment for social development. 5. Dependence can be placed on generalized teacher reactions from structured instruments for appraisal of group tendencies. 6. By and large, research of this type reveals a central tendency well above or well below normal. 7. The value and function of the developmental tasks concept have been found to be reasonable and productive. 8. The middle adolescent peer group follows a predictable pattern of development.

Recommendations

1. Both questionnaires were necessary for complete coverage of all behavior traits included in the study. 2. The last page of the Check Sheet for Appraisal of Peer Group Behavior could be omitted. 3. Descriptive evidence of the "active in sports" behavior trait should be added to the above questionnaire. 4. All teachers should be able to do a peer culture appraisal in terms of developmental tasks confronting the age group they teach. 5. The study of the group permits generalized reactions and tendencies and opens the way to individualized study. 6. Teachers should accept a definite position in community work with young people. 7. School time should be alloted for teachers to visit in the homes of pupils. 8. Observations in out of school activities are of great importance. 9. Since much learning occurs outside of school, questionnaires should be devised to obtain information on out of school social, religious and community work. 10. School records should be available to all teachers at all times. 11. School records should include the date by day, month and year. 12. Chronological age is not the best yardstick in placing students in the proper group for social progress and school 255 pages. \$3.30. Mic 57-896 work.

A COMPARATIVE STUDY OF THE AUDITORY
THRESHOLDS OF SPASTIC CEREBRAL PALSIED
ADULTS AND NON-HANDICAPPED ADULTS AS
MEASURED BY STANDARD AUDIOMETRIC AND
PSYCHOGALVANIC SKIN RESISTANCE PROCEDURES

(Publication No. 19,670)

Albert Winfield Koch, Ed.D. Boston University School of Education, 1956

The purpose of this study was to investigate and compare the auditory thresholds of spastic cerebral palsied adults and normal adults by means of standard pure tone audiometry and psychogalvanic skin resistance audiometry.

Thirty spastic cerebral palsied subjects between the ages of fifteen and fifty-five were selected and matched with a normal control on the basis of sex and age.

Two audiograms--psychogalvanic skin resistance and standard pure tone air conduction--were administered at the Winthrop Foundation, Massachusetts Eye and Ear Infirmary, Boston, Massachusetts. Statistical treatment of the data included t-tests of significance between groups and correlations of variables within groups. Summary of Results

- 1. Of the thirty spastic cerebral palsied cases, twelve, (40%), could not be conditioned. Six out of the thirty normal subjects (20%) could not be conditioned.
- 2. GSR thresholds of the normal and experimental groups differed significantly at the 1 percent level.
- 3. Standard pure tone thresholds for the normal and experimental groups differed significantly at the 5 percent level.
- 4. Mean latency time of the normal and experimental groups differed significantly at the 0.1 percent level. Latency was, on the average, longer for the experimental population.
 - 5. Mean amplitude of the two groups differed

significantly at the 0.1 percent level. The excursion amplitude was shorter for the experimental group.

- 6. The differences between the two groups relative to the number of trials for conditioning was not significant.
- 7. The total number of reconditioning sequences to maintain a satisfactory conditioned state for both groups differed significantly at the 0.1 percent level. The experimental group required a greater number of reconditioning sequences.
- 8. The correlation between the GSR thresholds and the pure tone thresholds for the normal group was 0.706 at the 0.1 percent level. For the experimental group the correlation was 0.826 at the 0.1 percent level.
- 9. Correlations for both groups between GSR threshold and latency, GSR threshold and amplitude, and number of trials necessary for conditioning and number of reconditioning sequences were not sufficiently great to exceed chance variation.
- 10. No difficulty was experienced in getting pure tone audiograms.

Conclusions:

The results of this experiment indicate that the normal and experimental groups were drawn from different populations; that is, significant differences do exist between the groups.

A significantly larger proportion of the experimental group (40%) could not be conditioned, compared to 20% of normals. However, if an experimental subject could be conditioned, he was no more difficult to condition than the normal control. More reinforcement was necessary with the experimental group to maintain a satisfactory conditioned state than with the normals. Latency time was greater for the cerebral palsied subjects and amplitude was shorter.

If the subject, cerebral palsied or normal, could be conditioned, the threshold found by GSR technique was a valid one.

115 pages. \$2.00. Mic 57-897

A STUDY OF CHILDREN'S ALLOWANCES IN THE EIGHT, ELEVEN, AND FOURTEEN YEAR-OLD GROUPS IN A SELECTED NEW YORK CITY PRIVATE SCHOOL

(Publication No. 16,615)

Judith Ehre Kranes, Ed.D. New York University, 1955

The Problem

The purpose of this investigation is to examine the periodic-allowances of children in the eight, eleven, and fourteen year-old groups in a selected New York City private school, in order to determine what the practices and problems are in the giving and spending of children's allowances, and to make suggestions that will be helpful.

Procedures

Data relating to the practices and problems in children's allowances were obtained from responses to question-naires. The questionnaires were administered to the children in the eleven and fourteen year-old groups in their class rooms, and the children in the eight year-old group were interviewed individually. The parents' question-naires were sent through the mail.

Responses were obtained from thirty-one children in the eight year-old group, thirty-two in the eleven year-old group, and thirty-three in the fourteen year-old group, These ninety-six children had eighty-four parents who responded.

The questionnaires collected data about allowance distribution, frequency and size of allowances, the factors determining frequency and size, the reasons for the receiving of allowances, the performing of chores with and without allowances, money requested in addition to allowances, allowance used to control behavior, the spending and saving of allowances, and the quarrels and problems about allowances.

Conclusions

Conclusions based on data were:

Over eighty-five percent of the children in each age group received allowances. The average weekly amount increased as the children grew older. The children's and parents' approach to the size and frequency of the allowance, and the reasons children received allowances took into account factors relating to the child's development.

More than one-third of the children reported doing chores for allowance money, while about one-twelfth of the parents so reported. About eighty-five per cent of the children asked for and received money in addition to their allowances. The eights' and elevens' requests centered first about things they wanted to buy, while the fourteens' requests centered first about things they wanted to do.

More than half the children reported allowance decreases for unacceptable behavior, while a little more than a third of the parents so reported.

The items children spent their money on reflected their development physically, intellectually, and socially. Responsibilities connected with allowance money increased as the children grew older. Responses of children and parents indicated a lack of budgeting and planning in this area.

More limitations were placed on the spending of the elevens' group than on the eights' group of children. The fewest limitations were placed on the spending of the fourteens'. The reasons for the limitations were mainly: health, foolishness, danger, and expense.

A large majority of the children in each age-group saved some of their allowance.

Allowance problems centered about allowance spending, additional money requested, chores required as part of allowances, and allowances used to control behavior.

Recommendations

Recommendations were drawn from the literature which seemed most pertinent to the findings. These were: that the part of the allowance which included responsibilities should be carefully planned; that the allowance amount should cover every day recreational wants of the child; that for the older child, it should be enlarged to cover events he can anticipate; that the additional money requested be for unusual things; that the child be expected to abide by the allowance; that the reasons for limiting the children's spending should fit their development, and take into account the values in a planned allowance; that the every day chores of children should be considered part of family responsibility and should not involve the allowance; and that allowances should not be used as means of controlling behavior.

141 pages. \$2.00. Mic 57-898

A STUDY OF SELECTED FACTORS INFLUENCING PERCEPTIONS OF AND CHANGES IN CHILDREN'S SELF-CONCEPTS

(Publication No. 20,001)

Hugh Victor Perkins, Jr., Ed.D. New York University, 1956

Purpose

The purpose of this investigation is to study the influence of four factors: (1) social-emotional climate, (2) teacher participation in an in-service child study program, (3) teacher acceptance of self and others, and (4) grade level on perceptions of and changes in the self-concepts of children in the fourth and sixth grades. Specifically, this research seeks (a) to ascertain the effects of the above four variables on teachers' perceptions of children's self-concepts, (b) to discover the differences between teachers and peer groups in their perceptions of children's self-concepts, and (c) to determine the influence of the above four variables on the changes children reveal in their self-concepts.

Procedure

A representative sample consisting of four fourth grade and four sixth grade classrooms in seven elementary schools of a suburban county school system in Maryland was selected so that extremes or marked differences with respect to each of the four dependent variables were represented. Classroom climates, group-centered and teacher-centered, were identified using Withall's Climate Index. Teachers who had completed the three-year inservice child study program sponsored by the Institute for Child Study of the University of Maryland were compared with teachers who had never participated in this program. A 50-item Q-sort was developed and used to obtain measures of all children's self-concepts and ideal selves, and it was also used by teachers to register their perceptions of selected children's self-concepts. A sociometric questionnaire was developed and used to obtain peer groups' perceptions of children's self-concepts.

Findings

1. Teachers' perceptions of children's self-concepts are in general positively and significantly related to these children's expressed self-concepts.

2. Teachers change significantly through time in the increased number of their perceptions of children's self-concepts which show a greater correspondence to those children's expressed self-concepts, but the magnitude of change is not significant.

3. Sixth grade teachers, teachers who have completed three years of child study, and teachers who are less accepting of self and others show in their perceptions of children's self-concepts a significantly greater similarity to these children's expressed self-concepts than do, respectively, fourth grade teachers, teachers who have never participated in child study, and teachers who are more accepting of self and others.

4. Neither fourth grade teachers nor sixth grade teachers show in their perceptions of children's self-concepts any significantly greater similarity with these children's expressed self-concepts than do fourth and sixth grade peer groups in their perceptions of the same children's self-concepts.

5. Peer groups in group-centered climates and those taught by teachers who have completed child study show in their perceptions of children's self-concepts a greater similarity with these children's expressed self-concepts than do peer groups, respectively, in teacher-centered climates and those taught by non-child study teachers.

6. Peer group perceptions of children's self-concepts are significantly more like these children's expressed self-concepts for "less threatening" percepts than they

are for "more threatening" percepts.

7. The self-concepts and ideal selves of children become increasingly and significantly congruent through time.

8. The self-ideal congruencies of girls generally are

significantly greater than those of boys.

9. Sixth grade children and children whose teachers have completed child study show significantly greater self-ideal congruency than do children, respectively, in fourth grade and those whose teachers have never participated in this child study program.

10. There is little or no relationship between changes in children's self-ideal congruency and (a) changes in their school achievement, and (b) changes in their acceptance by peers.

291 pages. \$3.75. Mic 57-899

A STUDY OF THORNDIKE'S THEORY OF MIND AND MENTAL DISCIPLINE

(Publication No. 19,863)

Nilza Coni Caldas Santos, Ph.D. University of Illinois, 1956

The object of this study is to explore Thorndike's notion of mind and mental discipline. Since the theory of mental discipline which was in vogue during his early period was formal discipline, the study is done in contrast with that theory.

Mind

The main points of Thorndike's concept of mind as developed in the study are as follows:

1. That original mind is neither a tabula rasa nor an agglomeration of power entities. Rather, mind begins with proclivities and potentialities for various forms of sensitivity and reactivity, which in turn correspond to an inherited organization of neurones and conduction units. This original mind and its corresponding nervous structure are flexible and plastic, hence man's capacity to change and to grow.

2. That mind is always expressing itself as the organism encounters a situation or stimulus, receives it, and reacts to it. In the life of stimuli and responses (S-R), mind (as potentialities, bonds, connections, and habits) is

always mediating.

3. That mind grows and, in fact, is always growing by the formation of habits and bonds following the laws of readiness, exercise, and effect.

4. That mind as formed and disciplined consists of habits (bonds and connections) organized into a functional hierarchy of simple and complex habits.

Mental Discipline

Discipline to Thorndike meant two things: (1) having a

certain number of habits which once possessed by the person could spread or transfer to new situations; and (2) discipline meant further training and development of habits and bonds.

The problem of mental discipline is always in the end the problem of generalization or transfer of training which involves:

(a) what to transfer, and

(b) how to transfer it in the process of generalization. The concept of generalization in Thorndike's works is involved in his theory of common elements. This reflected William James' contextualistic theory of dissociation by varying concomitants, as well as the acceptance of his radical empiricism. It is a theory which claims that generalizations attain their level of abstraction after the element (or elements) are experienced by the individual in many contexts. The transferable element can be classified as one of substance or content, and as one of procedure or method.

To have mental discipline in this theory means to possess an organization of functional habits. Thorndike's theory of man was an acceptance of individual differences by which the disciplined man was not conceived of as conforming to one single pattern. Mental discipline would thus not be solely a matter of training in reason, imagination, and other "faculties" of formal discipline, because mind in Thorndike's theory included more than the socalled intellectual aspects. Mental discipline referred rather to the sum of skills and knowledge, as well as character and temperament traits, which a person can attain according to his nature and his useful function in the social group.

172 pages. \$2.25. Mic 57-900

EDUCATION, TEACHER TRAINING

AN APPRAISAL OF ELEMENTARY SCHOOL SCIENCE INSTRUCTION IN THE STATE OF ILLINOIS

(Publication No. 18,973)

Helen Jean Challand, Ph.D. Northwestern University, 1956

The purpose of this study was twofold: first, to determine the practices and conditions of science teaching in the elementary schools by teachers in Illinois and by graduates of National College, Evanston, Illinois; second, to make a comparative appraisal of these practices through established principles.

Data were collected by means of a validated questionnaire, constructed to determine practices in the following
areas: objectives, content, method, evaluation, and teacher
background. One set of questionnaires was sent to five
hundred elementary-school teachers who were selected at
random from a stratified sample of principals in Illinois.
The second set of questionnaires was sent to a random
sample of three hundred graduates of National College.
The results of this study are based upon a fifty-three percent return from the teachers in Illinois, and a fifty-seven
percent return from the National College graduates.

A comparative appraisal of the data was accomplished

by using a set of established principles. Twenty science specialists judged these criteria to insure their validity for appraisal purposes.

The results may be summarized by comparing the judges' beliefs with the teachers' responses as to activities and conditions which foster the development of these principles in the classroom.

Objectives. There is high agreement of all judges and teachers concerning science objectives. Teachers set up objectives, but fail to provide opportunities for accomplishing these objectives.

Content. Forty-eight percent of the science taught is of a physical science nature; whereas, fifty-two percent is in biological science. A larger percentage of the primary teachers select and develop topics from a variety of textbooks and supplementary materials. A greater percentage of intermediate and upper grade teachers use a textbook selected by the teacher or administrator.

Methods and Materials. A variety of audio-visual materials are being used, but there are still many aids being neglected and some are used too infrequently. The average number of field trips taken by the pupils in the Illinois classrooms per year is 1.53; while the mean for the classes taught by the graduates from National College is 1.96 field trips per year.

Less than one third of the teachers provide opportunities for cooperative participation in group situations in establishing goals, methods of attaining goals, and methods of appraising results of group endeavor. The results showed that over one third of the teachers are not providing activities and conditions which will help children become familiar with and experience the democratic way of life. Procedures, autocratic in nature, were used by one third or more of the teachers.

Evaluation. Teachers are not using a wide variety of ways to evaluate science learning. The average number for both groups was six devices, ranging from twenty percent of the teachers using one device to nine percent using seventeen devices. One of the most used evaluative devices of the intermediate and upper grade teachers is that of written objective examinations. Teachers are not using a variety of subjective techniques. Less than one half of the teachers provide for any means or opportunity for cooperative evaluation.

Teacher Preparation. Seventy-one percent of the teachers' background in science is in biological science; whereas, twenty-nine percent is in physical science. Eleven percent of the Illinois teachers and thirty percent of the National College teachers have had a professional course in science methods and materials. Two thirds of the teachers have not had a course in audio-visual education.

Only one third of the schools are offering an in-service program which provides opportunities for professional growth in science content through faculty meetings, workshops, and conferences. 189 pages. \$2.50. Mic 57-902

A PROGRAM IN MATHEMATICS EDUCATION FOR WEST VIRGINIA TEACHERS OF SECONDARY MATHEMATICS

(Publication No. 19,738)

Alphonso Joseph DiPietro, Ph.D. George Peabody College for Teachers, 1956

Major Professor: F. Lynwood Wren

The purpose of this study was to investigate and to develop a functional program of mathematics education for the prospective teachers of secondary mathematics in West Virginia. Effort was made to evaluate the mathematics education program designed to prepare teachers of secondary mathematics in the state university and the state colleges, to appraise the program's strengths and weaknesses, and to formulate and recommend to the West Virginia Committee on Teacher Education a program of mathematics education for training these prospective teachers. The term, program of mathematics education, as used in this study, designated an organized body of knowledge, attitudes, and activities in pure and applied mathematics designed to train teachers of secondary mathematics.

The Procedures

The procedures for this study were as follows. (1) A survey of previous studies, discussions, and experience pertinent to the problem provided ideas, theories, explanations, and hypotheses valuable in attaining the ultimate objective of this study. (2) A second step was to determine from the literature those learning experiences which the beginning teacher of secondary mathematics should bring to his early teaching from his college preparation. (3) The learning experiences established by procedure 2 in combination with procedure 1 were used to formulate a tentative program for prospective teachers. (4) The tentative program was submitted in questionnaire form to a selected jury of one hundred nine mathematics education specialists, who have received professional recognition for work in their field. The comments of the jury were used in writing a description of the courses that should go into a program of mathematics education. (5) A status study in each state college was made where the chairmen of the mathematics and education departments were interviewed with regard to the institution's present mathematics education program for the training of teachers of secondary mathematics. (6) The findings of the status quo were evaluated in light of the mathematics education program formulated by procedure 4. (7) This appraisal provided a basis for a summary to be presented to the West Virginia Committee on Teacher Education, the most important element being a program of mathematics education for training prospective teachers of secondary mathematics.

Major Findings and Conclusions

Those salient findings and conclusions as found in this study concerning the area of mathematics education are listed hereafter. (1) The prospective teacher of secondary mathematics must be prescribed a program of mathematics education consisting of not less than thirty-two semester hours in certain courses under the supervision of the department of mathematics. (2) The first two years

of the present mathematics education program in West Virginia should be modified to include in the first year a thorough treatment of the number concept, the nature of proof, the concepts of function and measurement, as well as algebra, which would incorporate some of the elementary aspects of modern algebra, and trigonometry. Analytic geometry should be integrated with the calculus in the second year. (3) The consensus of the specialists was that the mathematics education program must provide for considerable work beyond the calculus and must include at least some training in modern algebra, modern geometry, statistics, history of mathematics, and applications and methods in teaching secondary mathematics. (4) Consideration must be given the mathematics of the last fifty years in training prospective teachers so as to give him an idea of the general meaning of modern mathematics. (5) Participation of the mathematics department in the prospective teacher's practice teaching must become an integral part of the student's training and not merely a series of individual conferences with the prospective 225 pages. \$2.95. Mic 57-903

A COMPARATIVE STUDY OF THE PREPARATION OF ART TEACHERS FOR AMERICAN AND GERMAN SECONDARY SCHOOLS

(Publication No. 18,937)

Max Ludwig Klaeger, Ph.D. University of Minnesota, 1956

The purpose of this study was to compare current patterns of preparation for secondary school art teachers in the United States and in Germany, and to identify and explain their distinctive characteristics. While the comparative-survey approach used in the study had several limitations, internal criticism and careful checking of data eliminated some of these.

A series of central questions guided the search for evidence, which encompassed an extensive survey of literature in both countries and a detailed study of six "specimens" of art teacher programs. Selected to represent the chief approaches adopted in the two countries, these institutions included the University of Minnesota, Iowa State Teachers College, The School of the Art Institute of Chicago, and the Academies of Fine Arts in Munich, Stuttgart, and Berlin.

Several descriptive research methods were used to collect the necessary data. Information derived from a carefully devised sixteen-page questionnaire was supplemented and checked by interviews with faculty members, visits to the institutions involved, and in two cases extended residence on the campus. The following statements briefly summarize the major findings.

(1) Among the most important factors affecting the preparation of art teachers in America are the unified comprehensive public school and the course credit system. In Germany the selective character of the secondary schools and the comprehensive examinations markedly influence art teacher training.

(2) In America, universities, liberal arts and teachers colleges, and separate schools of art prepare art teachers; in Germany this task is allocated to academies of fine arts.

(3) American programs seek to prepare communityminded art teachers with a broad general education and a diversified art background; German programs aim to develop a well-profiled artistic personality.

(4) The curriculum provisions for realizing these aims differ notably from country to country, with American programs typically requiring four years beyond the high school's twelfth grade, and the German ones four years beyond the thirteenth grade, plus a two-year teaching in-

ternship.

(5) In the American programs general education forms the largest component, followed by art studio work and professional education, including student teaching; whereas German curricula are heavily weighted with art studio work.

(6) American art education faculties usually combine extended pedagogical background with art competency. German professors are appointed primarily on the basis of their artistic reputation.

The differences found in the study between American and German programs were pronounced enough to indicate two distinct patterns of art teacher education. The following generalizations epitomize the conclusions drawn from the study.

(1) American art teacher education is experimental, relying on a variety of approaches. The programs in Germany are characterized by a normative system of preparation completely state controlled.

(2) American programs are strongly influenced by instrumentalist ideas, whereas the German courses of study exhibit realist and idealist traits.

(3) The ideal of democratic citizenship connects the incredibly varied American curricula. In Germany this aspect of education is neglected, with the programs concentrated on the development of an artistic personality.

(4) Both systems of preparation represent valuable contributions to art teacher education. Yet these may be jeopardized in America by an overemphasis on academic work and by a certain lack of continuity of program parts, and in Germany by poor adaptation to changing conditions and by overcentralization.

A series of recommendations directed to college teachers of art education in the two countries suggested that greater stress be placed in American programs on studio preparation and on better articulation of curriculum sections. Suggestions for German art teacher training pointed out the crucial importance of democratic values in the preparation of art teachers and the need for greater emphasis on experimentation and group procedures.

179 pages. \$2.30. Mic 57-904

A STUDY OF THE RELATIONSHIPS BETWEEN
CERTAIN TEACHER-SCHOOL CHARACTERISTICS
AND ACADEMIC PROGRESS, AS MEASURED BY
SELECTED STANDARDIZED TESTS, OF
ELEMENTARY PUPILS IN GRADES FOUR, FIVE
AND SIX OF NEW YORK STATE PUBLIC SCHOOLS
IN CITIES UNDER 10,000 POPULATION

(Publication No. 18,038)

Earl Francis Soper, Ed.D. Syracuse University, 1956

This dissertation is a study of the relationships between certain teacher-school characteristics and academic progress of elementary pupils in grades four, five and six located in the public schools of cities in New York State under 10,000 population. The three main teacher characteristics selected were teacher salary, teacher experience and teacher training. The main school factor considered was that of per pupil costs. Certain corollary factors including class size, marital status of the teacher, teacher morale, teacher travel, in-service training, cultural expenditures by teachers, residence of the teacher and city versus rural teachers were considered. Academic results were measured by the Stanford Achievement Test and intelligence quotients were secured by means of the California Short Form Test of Mental Maturity. In the survey, data was obtained on 2656 children. The data included pre-test achievement scores, intelligence quotients and post-test achievement scores. These children were taught by 128 teachers in both city and rural buildings, since all seven of the city school systems involved in the study were centralized. Schools included were Little Falls, Mechanicville, Salamanca, Sherrill, Canandaigua, Port Jervis and Norwich.

Relationships were shown by use of an analysis of co-variance technique in the case of all three teacher characteristics. This technique ruled out the effect of intelligence on the statistical results. Three categories were made in the frequency distribution for both teacher salary and teacher experience while teacher training was dichotomized. In the case of per pupil costs, partial correlation was used as a technique for showing relationships. The effect of intelligence was also ruled out in the case of the partial correlation procedure.

In the relationships between the salary paid teachers and academic pupil growth it was found that pupils produced significantly higher mean academic gain scores when taught by teachers with comparatively higher salaries. This correlation was found to be significant at the 1 per cent level of confidence.

The relationship between teacher experience and academic pupil progress revealed that pupils taught by teachers with more experience produced higher mean academic gain scores. This relationship was found to be significant at the 1 per cent level of confidence.

In the case of teacher training and its relationship to academic pupil progress, it was found that pupils produced higher mean academic gain scores when taught by teachers with less training, where training was dichotomized. This relationship was found to be significant at the 5 per cent level of confidence.

The relationships that might exist between the several corollary variables selected and academic pupil progress were not found to be statistically significant. However, an examination of teacher-school characteristics for those who taught the twenty-five rooms of pupils who made the highest mean academic gain scores indicated higher scores for teachers who had smaller classes, higher cultural expenditures, were single, and classified as "city" teachers.

The correlation between per pupil costs of the schools involved in the study and academic pupil progress was not found to be statistically significant. However, a correlation of per pupil costs and academic gain made by pupils on the Stanford Achievement test was highly suggestive, especially when the factor of total expenditure, including building costs, was considered, the significance of which needs to be founded on a much broader sampling of the per pupil costs of schools and this relationship to academic gain.

In this dissertation the reader is cautioned to realize that the study has examined but one educational objective, that of academic skills and knowledge, in determining relationships between teacher-school characteristics and academic gain made by certain elementary pupils.

135 pages. \$2.00. Mic 57-905

EDUCATION, THEORY AND PRACTICE

AN ANALYSIS OF THE EVOLVING EVALUATION PROGRAM IN ELEMENTARY GEOMETRY

(Publication No. 19,733)

Blanche Crisp Badger, Ph.D. George Peabody College for Teachers, 1956

Major Professor: F. Lynwood Wren

The purpose of this study was to trace the development of the present evaluation program in elementary geometry; to compile a list of objectives for the teaching of elementary geometry in the high schools of the United States; to analyze geometry achievement tests used in (1) College Entrance Examinations, (2) statewide evaluation programs, (3) commercial tests, and (4) current textbooks in order to determine if they are consonant with the objectives of teaching elementary geometry; and to present conclusions and educational implications regarding the evaluation program in elementary geometry.

Published literature in this field of instruction was analyzed to determine current objectives for the teaching of elementary geometry. Each question of every selected test was considered in the light of the objectives which it attempted to measure. A check list of objectives was used to record these data and summary tables were made to present information on each group of tests considered.

Conclusions and educational implications drawn from this study were:

- 1. Knowledge of geometric subject matter seems adequately tested by widely used tests in elementary geometry.
- 2. Abilities to apply formulas, theorems, deductive reasoning, and analysis to geometric problems seem adequately tested by the selected materials.
- 3. The use of nongeometric materials is an emerging practice in the teaching of geometry but has not played

so prominent a role in the construction of testing materials.

- 4. In an effort to test objectively and to save time the evaluation of some of the most desirable objectives of the teaching of elementary geometry has been neglected.
- 5. Questions on the history of geometry are rarely included in the testing materials of elementary geometry.
- 6. Information concerning geometries other than the traditional Euclidean pattern is not measured in the widely used geometry tests.
- 7. Testing the ability to present a well-organized argument has been sacrificed in objective achievement tests of geometry.
- 8. "The habit of clear thinking and precise expression," rated as the number one objective by many authorities in the field, seems neglected in the majority of the widely used standardized tests of achievement.
- 9. Generally the tests in textbooks have not been standardized.
- 10. Most of the texts in elementary geometry, copyrighted between 1950 and 1956, include some form of tests.
- 11. There is a definite need for tests in the instructional program of elementary geometry to measure or to evaluate attitudes, appreciations, interests, and habits.
- 12. In order to test improvement in the "intangibles," sometimes referred to as emotional factors, there is need for tests which may be administered before and after studying geometry.
- 13. The analysis of widely used testing materials in geometry shows that these materials do not seem adaptable to testing all the objectives in the teaching of geometry; therefore, a need exists for additional means of evaluating achievement in elementary geometry courses.
- 14. Whereas achievement tests were formerly the only evaluating instruments used to measure progress made from the study of geometry, they have now become recognized as only a factor of a complete evaluation program.
- 15. Although tests have been devised to test understanding of the nature of proof and critical thinking, they have not been used extensively in the evaluation program of elementary geometry.
- 16. In the evaluation programs of elementary geometry in the United States there is a need for a wider acceptance and a wider use of those practices and techniques recommended by authorities in the field.

141 pages. \$2.00. Mic 57-901

CONCEPTS OF DRIVER EDUCATION AND THEIR RELATIVE IMPORTANCE FOR A DRIVER EDUCATION COURSE IN THE SECONDARY SCHOOL

(Publication No. 18,758)

James Robert Blackburn, Ed.D. Boston University School of Education, 1956

The purpose of the study was to determine fundamental concepts for classroom instruction of driver education and their relative importance for a course at the secondary level. Need for the study evolved from a review of literature which revealed no standard driver education course has been developed and that to date little research of an objective nature concerned with subject matter has been undertaken.

The study was divided into two major phases, the first consisting of an analysis of selected textbooks, state courses of study, and 36 issues of <u>Safety Education</u> to obtain a list of concepts of driver education suitable for use at the secondary level.

Phase two was concerned with determining the validity and relative importance of each of the 295 concepts obtained in phase one. Validity was established by submitting the list to a group of authorities in the field of driver education. Concepts indicated by the jury as inaccurate were eliminated. The 210 items retained were considered by 75 per cent or more of the jurors to be accurate and consistent with current and accepted driver education practice and research.

Relative importance of the concepts was determined by submitting them to 26 law enforcement officials, 49 driver education teachers and 185 secondary-school students. Based on the per cent of raters indicating a concept as essential, desirable or unnecessary, the concepts were ranked in descending order of importance by each group. Coefficients of correlation computed by the Spearman rank order method indicated an unanimity of agreement between the three rating groups.

Finally, all raters were considered as one group and the concepts ranked in descending order of importance.

Conclusions drawn from the study were: (1) The list of 210 concepts of driver education evolved from this study are accurate and consistent with current practice and research; (2) The core of 154 concepts rated essential by 50 per cent or more of the total rating group should be included in the classroom phase of the driver education course in the secondary school; (3) Of the remaining concepts, 55 may be considered desirable and should be included if time permits; and (4) The high coefficients of rank correlation between the three rating groups indicates a marked relationship, or unanimity of appraisement, as to the relative importance of the concepts.

The core of concepts determined by this research may prove valuable to teachers, authors and other individuals or groups concerned with curriculum construction, course content, teaching materials and research in driver education.

Concepts ranking first through tenth in importance were:

- 1. Passing near the crest of a hill, on a curve, or at an intersection is extremely dangerous.
- 2. A sound driver possesses good attitudes, habits and emotional control which contribute to driving efficiency.
- 3. Under most circumstances a driver should not leave the scene of an accident until all legal responsibilities have been fulfilled.
- 4. Hand or automatic signals should be given decisively and soon enough to give any person affected ample warning.
- 5. Increased traffic volume requires more carefully trained drivers.
- 6. School-bus laws in most states prohibit cars from passing in either direction when a school bus stops to load or unload children on the highway.
- 7. Speed at night should be lower than during the day because visibility distances are reduced.

- 8. When the car skids, the driver should avoid using the brakes, turn the front wheels into the direction of the skid, and mildly accelerate the engine so that friction may be increased on the rear wheels.
- 9. Systematic driving instruction is better than a "trial and error" method of learning to drive.
- 10. The consumption of alcohol impairs vision, judgment, muscular coordination and efficiency, and reduces accuracy and speed of reaction.

283 pages. \$3.65. Mic 57-906

ANALYSIS OF A GRADUATE PROGRAM FOR COLLEGE STUDENT PERSONNEL WORK BASED ON DETERMINED CRITERIA

(Publication No. 17,766)

I. Clark Davis, Ed.D. Indiana University, 1956

Chairman: Dr. Louis G. Schmidt

The significance of the need for a study on the preparation of college student personnel workers was indicated by the national meetings of associations concerned with areas of student personnel functions and by the reports of study committees working on the problems of professional preparation at the graduate level. The expected increase of students in the undergraduate programs of colleges and universities and the corresponding increase in faculty was accepted as a reasonable prediction by most educators. The supposition that more faculty members than at present would be needed to participate in student personnel functions on a part-time or full-time basis appeared realistic. Thus, policies and educational practices in graduate programs of college student personnel work were needed to select the more qualified persons to enter graduate study for this professional field and to provide organized graduate experiences to meet the needs and interests of the prospective student personnel workers in order that high quality performance in college positions could be expected in the numbers needed.

The purpose of this study was to determine directions for future development for the graduate program for college student personnel work in the Graduate Division of the School of Education at Indiana University.

The problems were (1) to determine some criteria for graduate programs for college student personnel work, and (2) to analyze the policies and educational practices of the graduate programs of study in this field at Indiana University in terms of these criteria.

Procedures

Prior to an analysis of a program of graduate education for college student personnel work, it was essential that some determined criteria be used. The criteria were developed as a result of a survey of criteria for preparation of college student personnel workers presented by professional organizations, of a survey of policies and educational practices in graduate programs for college student

personnel work in 11 midwestern universities, and of an evaluation of preliminary criteria by a jury of 19 experts in four areas of the profession.

The interview guide used in surveying the policies and educational practices covered the general procedures used in the selection and the preparatory experiences suggested for college student personnel workers. Interviews were conducted with selected faculty and administrative personnel at each university. On the basis of information received, a descriptive analysis was made of each of the programs for preparing graduate students for professional work in college student personnel services.

Preliminary criteria were evaluated by the 19 selected experts. For Part A of the questionnaire—Selection of Students for Graduate Programs in College Student Personnel Work—the frequency of each rating (required, recommended, not recommended) was computed by criterion item and percentages calculated. Items which had a frequency percentage in the required category of 50 percent or higher were placed at the required level. For Part B—Preparation of Graduate Students for College Student Personnel Work—the criteria judgments were weighted and a mean index of each criterion was determined. A criterion with a mean index of .5 or higher was placed at the required level of determined criteria.

Some determined criteria were established for the selection of graduate students for college student personnel programs of study and for the preparatory experiences leading to positions as administrators of college student personnel work, activities counselors, general counselors, and residence halls counselors. These determined criteria were used in an analysis of the graduate program for college student personnel work at Indiana University.

Conclusions

The results of the study indicated: (1) A common core of courses and practicum experience should be developed in graduate programs for college student personnel work. (2) Practicum experiences should be varied more than present practices indicated and should be supervised more adequately than currently. (3) Graduate students majoring in other academic disciplines should be given opportunities for organized experiences in college student personnel work. (4) Separate programs of study can be developed for areas within the college student personnel field, and these outlines of courses and practicum experiences are broad enough to meet institutional requirements and to provide electives to meet the needs of individual graduate students.

Recommendations

The major recommendations included (1) outlines of proposed programs of study at Indiana University for preparation of administrators of college student personnel work, of activities counselors, of general counselors, and of residence halls counselors; and (2) procedures to supplement present policies and practices in the selection and admission of graduate students for both the master's and the doctorate programs with concentrations in college student personnel work.

277 pages. \$3.60. Mic 57-907

THE POTENTIAL ROLE OF PUBLIC COMMUNITY JUNIOR COLLEGES

(Publication No. 19,743)

Emol Atwood Fails, Ph.D. George Peabody College for Teachers, 1956

Major Professor: Roosevelt Basler

This study was concerned with an answer to the question, "what is the potential role of a public community junior college when considered as a part of a system of publicly supported education?"

Limitations

The problem was limited to the consideration of publicly supported community junior colleges.

Definition

A community junior college was defined as an institution which, as a part of the local public school system, provides a variety of educational opportunities free to all persons who, having passed the normal age for completing the twelfth grade, need or want to continue their education. It does not provide formal education beyond the fourteenth grade normally considered to be transferable to institutions of higher learning.

Purposes of the Study

The purposes of the study were: (1) to trace the developing objectives of the present community junior college; (2) to identify the major characteristics of a community junior college; (3) to ascertain the potential role of the community junior college by comparing it to secondary schools and to institutions of higher learning, and by analyzing its relationship to the democratic way of life and to world affairs.

Method of Research

The method of research was the deliberative method. The constructive pattern within the deliberative method was followed.

Importance of the Study

The study was shown to be important because of:

- 1. The rapid growth of public junior colleges
- 2. The advocation of lengthening public education
- 3. The report of the President's Commission on Higher Education
 - 4. The emergence of the "community college" concept
 - 5. The inevitable flood of high school graduates
 - 6. The dynamic nature of social and economic systems

Summary of the Findings

From 1900 to 1929, the purposes of the public junior college gradually changed from those of strict duplication of the first two years of the four-year college to inclusion of terminal education.

From 1930 to 1941 terminal education was expanded

into a broad comprehensive offering for not only high school graduates but also adults.

From 1941 to 1955 the purposes of the public community junior college were expanded to include the "community college" concept.

The purposes of the community junior college are different from those of the high school in that the former extends general education through two additional years and places terminal education closer to the employment age.

The purposes of the community junior college are different from those of institutions of higher learning in that the entrance into institutions of higher learning is usually for those who are high school graduates only, while the community junior college accepts any who are old enough to have finished high school.

The following proposed system of public education was advanced in Chapter IV:

1. As much of the vocational education as is possible should be shifted from the public high school to the community junior college.

2. Four-year colleges and universities should be relieved of the first two years of instruction and this function shifted to the community junior college. All students entering the four-year college or university should be transfers from a community junior college or its equivalent.

To administer the proposed system, a unified single board or commission was suggested which should control all public education from the kindergarten through the graduate school.

Research in the various aspects of community junior colleges--administration, teaching, curriculum making and the like--should be done. The proposed system outlined in Chapter IV should be experimented with by some state or school district within a state.

166 pages. \$2.20. Mic 57-908

THEORETICAL ISSUES IN DRAWING INSTRUCTION

(Publication No. 19,926)

George Albert Harris, Ph.D. Stanford University, 1956

The problem with which this study is primarily concerned is the formulation of a sound philosophy of drawing and drawing education. From a careful study of available literature in this area, there does not appear to be a sufficiently consistent and comprehensive theory of drawing instruction practised in art education today in this country. For this reason, this study attempts to build foundations upon which a comprehensive theory of drawing instruction can be based. Evidence of conflicting and divergent viewpoints in terminology, theory, and practice is introduced from the literature to further indicate the need for such a philosophy. This evidence also demonstrates that the solution to the problem is inherent in the rich variety offered by this very divergency of viewpoint. It is inferred that confusion is implicit in this variety, and that, at the present time, this confusion tends to complicate the practice of drawing instruction rather than to clarify its methods.

The research procedure utilized in this study presents pertinent data from literary sources of historical and

contemporary points of view concerning the concepts of drawing and of drawing instruction. Terminology, theory, and practice are analyzed to gain more knowledge of, and insight into, the nature of drawing. Variety of foci in the history of drawing instruction are presented to demonstrate the richness and diversity prevalent in drawing and in its potentially successful instruction. As a result, five major theories of drawing instruction are selected and analyzed. Philosophical implications motivating these theories are considered as the bases upon which the major theories of drawing instruction are established. Critical theories are analyzed in terms of their contribution toward building significant working hypotheses for a successful philosophy of drawing education. The prospects of such a philosophy helping to lay the foundations for a comprehensive theory of drawing instruction are discussed in this study.

Results from this study indicate that this variety can be classified under five major emphases to lessen much of the confusion which tends to result from the variety of viewpoints found in the literature regarding theory and practice. The variety becomes manageable and understandable when these five emphases are seen to underlie corresponding theories in drawing instruction.

This study concludes that confusion becomes explicit in the theories of drawing instruction when the teacher accepts any one of the theories as a totalitarian method, instead of recognizing that each is only a component of the whole comprehensive theory. It concludes that theoretical issues in drawing instruction can best be analyzed and clarified by a comprehensive philosophy of drawing education which incorporates the five major drawing theories stressed in this study. These theories, when integrated, afford a more comprehensible method of instruction, and help to develop greater understanding of the meaning and function of perceptive and convincing drawing instruction. A comprehensive theory also offers a more effective means of dealing with the problem of individual differences inherent in all learning situations because it represents a great variety and breadth of scope. It is advocated that an educational philosophy in drawing instruction which recognizes valid individual differences in drawing, and which helps to strengthen them in a constructive way, makes the most valuable contribution to a more significant educational process. In particular, it encourages and develops more imaginative and creative drawing expression. This kind of learning experience, and expressive activity, is also quite valuable in helping to combat general aesthetic inertia, as well as to oppose unquestioning conformity to mediocrity. 221 pages. \$2.90. Mic 57-909

THE ROLE OF THE COUNSELOR AS PERCEIVED BY SENIORS, ADMINISTRATORS, TEACHERS AND COUNSELORS IN SELECTED NEW YORK STATE PUBLIC HIGH SCHOOLS

(Publication No. 19,380)

Hubert Whitney Houghton, Ph.D. Syracuse University, 1956

Purpose and Population

This study investigated the guidance counselor's role as perceived by 2690 seniors, 729 teachers, 39 administrators

and 53 counselors in 19 New York State public high schools in the school year, 1953-1954. Counselor role was predicated on the basis of assistance accepted from him in three problem areas of students and of his authoritarian and social status.

Procedure

After their validity and reliability were ascertained, the questionnaires, Let the Student Judge and Let the Administrator and Teacher Judge, were administered. Each questionnaire consisted of sixteen like problem situations, three each being representative of the educational-vocational, academic, personal-social-emotional and neutral areas and two each, representative of authoritarian and social status. For each area situation, the respondent made three choices in order of preference of persons to help the student; for each status situation, preferences were limited to school personnel.

Analysis of the Data

"Scoring" of each situation permitted information percentagewise of how many of each group of respondents in tōtō and categorized by guidance program quality, school size and school location selected as first, second and third choice (a) counselors, (b) administrators, (c) other school personnel, (d) parents, (e) non-school personnel, and (f) young friends or (my)self. Responses were also "scored" for seniors categorized by sex.

With critical ratios determined for first choices only, hypotheses tested stated that there would be no differences in perceptions of the (a) activities and (b) status of the counselor among: (1) seniors, administrators, teachers and counselors; (2) schools with high-ranking, average and low-ranking guidance programs; (3) seniors categorized by sex and seniors, administrators, teachers and counselors categorized by school size and location.

Significant Findings

Testing for significant differences revealed:

(1) The four groups of respondents perceived the counselor role similarly only in the academic area and accorded the counselor little authoritarian or social status.

(2) Adult respondents perceived greater counselor involvement in the educational-vocational and personal-social-emotional areas than did seniors.

(3) High-ranking guidance program seniors gave the counselor the most prominent role in the educational-vocational area and low-ranking guidance program seniors and faculty gave him the least prominent role in the academic area.

(4) Counselors of all quality guidance programs were perceived by all groups of respondents as having little authoritarian status, while average-ranking guidance program seniors and faculty accorded the counselor more social status.

(5) A sex difference was not operative among seniors to determine counselor activities or status.

(6) School size entered significantly only in the academic area, with small and large school seniors perceiving greater counselor involvement than their mediumsized school counterparts.

(7) Rural seniors perceived greater counselor involve-

ment than urban seniors in the educational-vocational and academic areas and less, in the personal-social-emotional area; rural faculties saw the counselor more involved in the academic areas than did urban faculties.

(8) Large and small school seniors gave the counselor a more authoritarian role than medium-sized school seniors as did large as opposed to medium-sized school faculties.

(9) Medium-sized and small school seniors and faculty and medium-sized as opposed to large school administrators perceived a less social role for the counselor than their confrères.

(10) Urban and rural respondents showed no significant differences in status perceptions.

576 pages. \$7.30. Mic 57-910

CERTAIN CRITICAL REQUIREMENTS FOR THE SECONDARY SCHOOL COUNSELOR DETERMINED FROM AN ANALYSIS OF CRITICAL INCIDENTS REPORTED BY TEACHERS

(Publication No. 17,654)

William Browning King, Ph.D. New York University, 1956

The primary purpose of this investigation was to determine the behaviors of secondary school counselors which result in their being regarded effective or ineffective by teachers. These behaviors were then ordered into critical requirements for the counselor's job and analyzed to determine their implications for two known counselor training programs.

The method employed is known as the critical incident technique. Basically, the technique is a set of principles for collecting, analyzing, and classifying behavioral descriptions of performance of an activity to determine requirements judged to be critical.

A total of 304 critical incidents was reported by teachers in individual or group interviews. These incidents yielded 322 critical behaviors of which 204 were effective and 118 ineffective. The behaviors yielded fifty-three critical requirements which were grouped under the following areas: Demonstrating Professional Competence in (1) Staff; (2) Pupil; (3) Parent; and (4) Community Relationships and Services.

The classification procedures were checked at three intervals by independent judges who averaged approximately ninety-eight per cent agreement with the classifications. Ten professionally trained counselors averaged ninety-eight per cent agreement with regard to the critical nature of the requirements.

Analysis of the data revealed no significant relationship between the counselors' sex and effectiveness of behavior. Significantly more ineffective behaviors were reported for counselors over the judged age of forty years. No significant relationship was found between teachers' reports of effective behaviors and their sex, age, or marital status.

Based upon the data and subject to the limitations of the investigation, these conclusions seem warranted:

1. Additional behavioral reports from teachers would have added little to the classification system.

- 2. The methods inherent in the critical incident technique tended to yield reliable data.
- Teachers recognize certain leadership responsibilities of counselors and anticipate the fulfillment of the responsibilities.
- 4. The effective counselor develops communications with teachers and keeps them informed about guidance services.
- 5. Teachers desire and expect to participate in pupil personnel services.
- Teachers regard the effective counselor as one who is concerned with discipline.
- 7. Teachers distrust and disapprove of counselors who fail to protect confidences entrusted to them.
- 8. The effective counselor must view his job in perspective with regard to the total educational program. He must strive continually to reconstruct his functions in view of emerging problems and changing concepts in the educational scene.
- 9. The effective counselor is judged by teachers to be one who extends his functions to include working with parents and available resources in the community in providing for pupil needs.

From this investigation it is evident that the following areas of behavior or relationships offer implications for the training of counselors: counselor selection; counselor-teacher relationships; counselor's role in discipline; treatment of confidential data; counselor-parent relationships; counselor-community relationships; counselor skill in human relations; and counselor research.

Further studies suggested by this investigation are:

- Extension of this investigation to include respondent groups composed of others who are in a position to observe counselor performance and thus complete the listing of critical requirements.
- That the critical requirements be used as a basis for developing check lists, tests, or rating scales for selection or evaluation of counselors.
- 3. Similar studies should be conducted with a view to refining and testing further the methodology employed in this investigation.
- 4. Finally, that a follow-up investigation be undertaken utilizing the same technique and respondent group as a further check on the validity and reliability of this investigator's findings. 134 pages. \$2.00. Mic 57-911

INFLUENCES OF SCHOOL SIZE AND CONSISTENCY OF INSTRUCTION ON ACHIEVEMENT IN ENGLISH AND HISTORY OF 1954 GRADUATES OF SMALL MONTANA HIGH SCHOOLS

(Publication No. 18,689)

Henry William Knapp, Ph.D. The University of Nebraska, 1956

Adviser: J. Galen Saylor

Statement of the Problem

The purpose of this study is to compare the achievement of Montana high school seniors of 1954 in small schools (75 pupils or less) with that of seniors in larger schools (approximately 300 pupils). The fields selected for comparison are English, American history, and world history-subjects which are a common background for most of the pupils.

A secondary purpose is to note the influence of consistency of instruction factors, which included the effect of (1) length of instruction in a subject area, (2) change of school systems, and (3) having the same teacher repeatedly.

Procedures

Seniors from forty-seven small schools and eight larger schools, each group approximating 400 pupils, constituted the sample for pre-graduation testing in April and May, 1954. Each group was given (1) Form PM, Cooperative English Test, (2) Crary American History Test, and (3) Cummings World History Test. In addition, the pupils took the Terman-McNemar Test of Mental Ability as I. Q. and sex were selected as the basic matching criteria in calculating the analysis of variance for the school size and consistency of instruction variables. Information on schools attended, the English and social studies courses taken in high school, and the names of instructors were procured from individual Student Data Sheets.

Findings

In the testing, the 1954 graduates achieved the following median percentiles according to national norms for the selected tests: 27 in English (about the tenth grade level of achievement), 62 in American history and, 51 in world history.

The greatest source of variance found was the effect of the sex of the pupils--girls achieved better in English while the boys excelled in both histories.

School size had little relationship to achievement in English and history in this research; in 33 out of 36 cases of analysis of variance, no significant differences existed.

The amount of course work in English and social studies had little relationship to achievement. No significant differences existed between boys and girls with four years of English and those with three; likewise, the effect of speech and journalism classes on achievement in English was negligible.

In 11 out of 12 cases of analysis of variance concerning change of school systems (at both junior and senior high school levels), no significant differences existed.

The students who had the same English teacher two years had slight advantage over those who had a different teacher each year and also over those who had the same teacher three or four years. Having the same teacher in American and world history was significant to the boys' achievement, but not the girls'.

The influence of a world history course upon a test in American history was not significant. The relationship between having a course in world history and world history test results was significant for the boys, but not for the girls.

Implications

The results of any study in group achievement which disregards the sex factor may be questioned, as this factor outweighs many other variables.

In 1956, the Montana State Board of Education is endeavoring to strengthen English instruction in secondary schools. This research would indicate that the board's previous step of requiring four years of English instead of three was insufficient to remedy this statewide weakness.

The small school should attempt to reduce teacher turnover to accomplish consistency of instruction. In school size comparison, poorer achievement in English and history cannot be used as an argument against the small high school. Any pleas for consolidation should consider other factors, such as finances or breadth of program.

383 pages. \$4.90. Mic 57-912

A DESCRIPTIVE ANALYSIS OF A THREE YEAR CORE PROGRAM AND AN APPRAISAL OF ITS EDUCATIONAL EFFECTIVENESS

(Publication No. 19,847)

Evelyn Mildred Lucking, Ed.D. University of Illinois, 1956

This field study was conducted for two principal purposes. One was to help satisfy the need for a detailed description of what actually happens in the day-by-day operation of a core course. The second was to secure factual data relating to current allegations that, compared to standard offerings, the core course is of little educational value and that, in particular, the fundamental intellectual skills are not well taught to pupils in core courses. The study dealt factually with a three-year core program which was developed in grades six, seven, and eight in the years 1951-1954 in the Burris Laboratory School of Ball State Teachers College in Muncie, Indiana.

A detailed description of that core program was given. This was based on a log kept by the core teacher, on her records of parent conferences, on the permanent school records of the core pupils, and on representative samples of their work.

The growth of the core pupils was appraised by means of standardized test results, observations of pupil behavior, and representative samples of their work. The later achievement of the core group in two ninth grade classes was appraised on the basis of teacher marks assigned to them at the end of the freshman year of high school. In addition, the growth evidenced by the core group at the end of the eighth and ninth grade years was compared with that of another class which had had different kinds of learning experiences during the sixth, seventh, and eighth grades in the same school.

The normal grade-equivalent gain expected on the

Metropolitan Achievement Tests between September 1951 and May 1954 was 2.7 years. The median grade equivalent gain made by the core group reached or surpassed 2.7 in spelling, geography, history, vocabulary, and science. In literature and English the gain was 2.5 years.

The core group showed somewhat greater median and average growth than did the non-core group during the eighth grade year. This was indicated for the total number of students in each group, as well as for a smaller number when the two groups were equated on the basis of intelligence quotients.

Comparison of teacher marks earned in ninth grade English and science classes showed the pupils of the core group earning more than their expected proportionate number of each passing mark and those of the non-core group earning fewer. When the two groups were equated on the basis of intelligence quotients the same pattern existed with respect to marks earned in English classes, though in the science classes the equated groups of core and non-core pupils achieved exactly the proportionate number of passing marks expected in each instance.

The evidences of growth presented and analyzed seemed to indicate that pupils from the three-year core group were not handicapped in their later academic studies, judged by the marks earned in English and science classes that seemed somewhat comparable to the kinds of experiences that the pupils had had in the core course. The evidence of this study seemed to indicate that the core pupils were at least as well prepared for successful high school work.

345 pages. \$4.45. Mic 57-913

SOME CONTRIBUTIONS OF A GENERAL BEHAVIOR THEORY FOR CURRICULUM

(Publication No. 19,115)

James Bradley Macdonald, Ph.D. The University of Wisconsin, 1956

Supervisors: Professor Virgil E. Herrick and Professor Paul W. Eberman

This study was directed toward the utilization of a general behavior theory for the conceptualization and analysis of problems in curriculum development. The study was limited to the specification, examination, and analysis of theoretical concepts of behavior theory and curriculum.

It was illustrated that curriculum concepts are not related to a systematic behavior theory in practice, and that curriculum theorists do talk about behavior as an important aspect of curriculum. This study was an attempt, therefore, to incorporate certain curriculum problems in the framework of a systematic behavior theory.

Two basic curriculum problems were isolated. The first problem area was concerned with the conceptualization and discussion of basic curriculum referents- the child, social needs or problems, and human knowledge. The second problem area was concerned with four decisions that must be made in the process of curriculum development. The curriculum decisions examined were decisions about objectives, the selection of learning experiences, the organization of curriculum elements, and the evaluation of pupil behavior change.

Basic curriculum referents were described as value clusters which are sources for making curriculum process decisions. It was illustrated how the values which are attached to dominant referents change the quality of the process decisions. Each decision was discussed in terms of value dominance placed upon the child, society, or human knowledge. Three curriculum designs: child-centered, social-centered, and knowledge-centered, were used to illustrate resultant patterns of process decisions.

A general behavior theory was elaborated. This theory is called action theory and deals with behavior on the level of the act. Action theory conceptualizes personality, society, and culture as systems. Personality and society are empirical motivated systems and culture consists of systems of symbolic patterns.

The idea that the acts of motivated systems take place in action space dimensions was discussed. These action systems have phases through which they pass over time. A latent phase, adaptive phase, goal-gratification phase, and integrative phase were considered. It was shown how systems are directed toward maintaining their boundaries and maintaining bounded equilibrium during their phase movements in the dimensions of action space.

An analysis of basic curriculum referents and important decision processes was tendered in relation to action systems and the phases and dimensions of action.

Certain broad generalizations were forthcoming from this analysis. These generalizations were: (a) that curriculum development is concerned basically with behavior change; (b) that the process of curriculum development is a developmental behavior process; (c) that action theory is a powerful analytic tool for conceptualizing problems in curriculum; and (d) that action theory has certain terminological and conceptual difficulties when utilized for the examination of curriculum problems.

Four important results of this study were discussed.

(1) The basic curriculum referents are separate actions systems and may be clearly differentiated in terms of the boundaries discussed in action theory. (2) Subject matter as cultural systems has meaning only in relation to the empirical personality and social systems. Subject matter may be used as a latent plan for a curriculum pattern prior to the classroom situation, but subject matter is not a basic referent in the action context. (3) Curriculum process decisions were shown to be basically the same decision in different phases of curriculum action, and (4) The four decision processes were shown to be describable in relation to each other, rather than separate logical steps with separate referents.

234 pages. \$3.05. Mic 57-914

THE EDUCATIONAL IMPLICATIONS OF AN INDIVIDUAL LONGITUDINAL CASE INVENTORY

(Publication No. 20,078)

Robert Emmett Martin, Ed.D. Michigan State University, 1956

The purpose of this study was to summarize the multiple growth data collected on one child over a period of time and to point up by graphic and longitudinal methods interrelationships which existed among his different aspects of growth and development and, from the interpretation of these data, to draw implications for educational practice which would demonstrate how data on an individual child might be helpful in planning a program of instruction which would more realistically meet the needs of the individual as well as point out how the same technique may be used for each child in the educational program.

Longitudinal growth data on this child were obtained from the Child Development Laboratory of the Bureau of Research and Services of the College of Education at Michigan State University. The data covered the following four areas: (1) Physical Development, (2) Mental Development, (3) Subject-Matter Achievement, and (4) Personality, Aptitudes, and Abilities. These data, collected over a period of twelve years by the laboratory personnel, included actual measurements of height and weight at frequent intervals, mental ability tests, personality and interest inventories, periodic anecdotal records of the individual's behavior throughout the study, information from the school records, and interviews with the boy's teachers and parents.

The Olson and Courtis techniques of interpretation of growth data were used to discover the individual's patterns of growth and the interrelationships which existed among them.

From the analysis and interpretation of these data it was concluded that the school did not provide the type of learning experiences for the child which were consistent with child growth and development principles. It was assumed that if the learning experiences planned for the individual had been geared more nearly to his needs, interests, and abilities positive changes might have been affected in his academic achievement, as well as in his personal-social relations and his attitudes, habits, and emotional adjustments.

Implications were drawn from this longitudinal case inventory for individualizing the program of instruction for the boy under study. An attempt was also made to show how like data for children could contribute to the individualization of the curriculum for each child in a group. Suggestions were made in the areas of evaluation and testing, meeting individual interests and needs, personal-social relationships, motivation for learning, and effective home-school relations.

This study was meant to be illustrative of how individual methods could be used to adapt the curriculum to the learner. 151 pages. \$2.00. Mic 57-915

THE EFFECTIVENESS OF TELEVISION AS A MEDIUM OF LEARNING TYPEWRITING

(Publication No. 17,664)

William Robert Pasewark, Ph.D. New York University, 1956

The purpose of this study was to determine the effectiveness of television as a medium of learning beginning typewriting. Literature has shown that there is a great need for experimentation in educational television and especially in the area of measuring the effectiveness of learning through television.

The effectiveness of students learning beginning type-writing through television in an Experimental Section was compared with students learning by conventional class-room methods in a Conventional Section. Students in the Experimental Section were matched by the individual pair method with similar students in the Conventional Section on the basis of American Council on Education Psychological Examination scores.

The Conventional and Experimental Sections followed the same course of study for 48 lessons of 50 minutes each, all of which were taught by the investigator. There were no instructors regularly assigned to the Experimental Section. The findings revealed that telestudents typed significantly faster than conventional students on a timed writing test at the conclusion of the course. With regard to the pattern of learning, telestudents were generally superior to conventional students when comparing typewriting speed and accuracy on a series of nine timed writing tests throughout the course. It appears, however, that the pattern of learning for both sections tends to be similar. Conventional students had less mean errors than telestudents when comparing a production test consisting of the preparation of a tabulation and a personal business letter at the end of the course. The difference, however, was not statistically significant.

It was concluded that (1) Telestudents' typewriting performance on a timed writing test at the conclusion of the course was superior to the conventional students' performance on an identical test, (2) Telestudents' pattern of learning to typewrite tended to be similar to conventional students' pattern of learning to typewrite, and (3) There is no significant difference in telestudents' and conventional students' ability to use typewriting skills to complete a production test at the end of the course.

The findings of this study lead to the general conclusion that television is an effective medium of learning beginning typewriting.

191 pages. \$2.50. Mic 57-916

ENGINEERING

ENGINEERING, GENERAL

FIRE RETARDANT INVESTIGATIONS OF PHOSPHORYLATED AMINOETHYL CELLULOSE STRUCTURES

(Publication No. 20,068)

Laurence Twomey Cleary, Ph.D. Columbia University, 1954

Older methods for producing durable flame-resistant treatments for cotton fabrics by chemically combining phosphoric acid or some phosphate derivative with cellulose by esterification reduced the fabric strength through hydrolytic degradation. In addition, the acid groups of the esterified cotton were subject to ion exchange which destroyed the fire retardancy. Binding phosphorus compounds physically to cellulose by means of resins, although reducing degradation and increasing the resistance of the retardant to ion exchange, resulted in a nonpermanent resin treatment which stiffened the fabric.

The purpose of this research was to investigate a chemical process for rendering cotton fabrics durably fire resistant by first aminating the cellulose without incurring degradation and then phosphorylating with specific reagents through the active amine groups. The specific objectives were to: (1) improve the amination method to provide sufficient amine groups for the degree of phosphorylation necessary to inhibit combustion, (2) develop methods for durably phosphorylating aminated cotton with reagents resistant to leaching and to ion exchange, (3) compare the fire retarding effectiveness with that of other treatments, and (4) determine the commercial feasibility of the phosphorylated aminated process.

Efficiency of amination was improved 200 per cent over previous methods reported in the literature. Side reactions such as saponification of the reagent and byproduct formation rather than the reactivity of the cellulose structure limited the degree of amination attainable in a single treatment. The degree of amination was found to be dependent upon the: (1) fabric construction, (2) immersion time in solution, (3) solution composition and concentration, and (4) reaction conditions of temperature, time, and fabric tension. Best results were obtained by impregnating the cotton fabric for two minutes with a solution containing 20 per cent aminoethylsulfuric acid and 25 per cent sodium hydroxide, heating at 100°C. for 60 minutes in a taut condition, and rinsing for 15 minutes to remove excess reagents.

By reacting aminated cotton with cold aqueous phosphoric acid, fabrics exhibiting excellent flame- and glow-retardancy were obtained. The retardant was intimately and uniformly distributed throughout the cellulose. This treatment, however, was readily susceptible to leaching and to ion exchange which nullified the fire retardancy.

The increased reactivity of the aminated cellulose facilitated phosphorylation in the presence of urea at 130°C., producing fabrics superior in properties to unaminated phosphorylated fabrics. The structure of the

phosphorylating agent affected the reactivity, producing varying degrees of phosphorylation and fabrics having different fire retardant characteristics. Victamide, a commercial ammonia-phosphoric anhydride complex, was the most efficient, reacting within three minutes to produce fabrics having excellent fire retardancy and hand, and fair resistance to ion exchange. Although complete resistance to ion exchange was obtained by phosphorylating with tetraethylpyrophosphate, the fire retardancy was negligible. Aminated fabrics were readily phosphorylated with dialkyl pyrophosphates and these exhibited excellent fire retardancy, good resistance to ion-exchange, but low fabric strength.

Phosphorylated aminated cotton was less degraded and more resistant to combustion than the phosphorylated unaminated fabric, but the treatment possesses certain disadvantages, namely: (1) excessive fabric shrinkage, (2) long amination reaction time, and (3) degradation from both the amination and phosphorylation reactions.

A correlation between fire retardancy, bond strengths, and structure was obtained by evaluating the burning characteristics of fabrics phosphorylated with pyrophosphates, phosphonates, phosphate esters, phosphate salts, and phosphoramides, and proved helpful in explaining the function of phosphorus fire retardants. Inhibition of combustion appears to be a two-step reaction, with the phosphorus compound first dissociating to form the active phosphorus retardant which acts to control the rate and mode of degradation of the cellulose. Since the rate of dissociation is evidently the controlling step in the inhibiting reaction, and is clearly dependent upon the structure of the phosphorus compound, fire retarding effectiveness can be related to the standard free energy of the compound. The effect of structure on fire retardancy was the same whether the phosphorylating agent was physically or chemically combined with cellulose. The latter, however, being more thermally stable, required more phosphorus 150 pages. \$2.00. Mic 57-917 to inhibit combustion.

ENGINEERING, AERONAUTICAL

ON ROTATIONAL INVISCID FLOW GENERATED BY AIRFOILS OR BODIES OF REVOLUTION PLACED SYMMETRICALLY IN A SUPERSONIC STREAM (PARTS I AND II)

(Publication No. 20,125)

Abraham Kogan, Ph.D. Princeton University, 1956

A method of successive approximations to the ideal flow around airfoils and ogives of revolution at high Mach numbers is developed, based on the concept of Crocco's Stream Function. In Part 1 the flow around airfoils is treated. Taking the undisturbed flow as a starting point, a second approximation to the flow in the whole region surrounding the airfoil is derived and the results for velocity and pressure distribution at the airfoil surface are compared with the corresponding expressions obtained by potential flow theory.

Taking the flow behind a plane shock wave as zeroorder approximation, the flow in the vicinity of the leading
edge is next attacked. The first approximation gives an
expression for the shock wave curvature at the leading
edge, which checks similar results obtained by other investigators. The second approximation yields expressions
for the derivative of the shock wave curvature and for the
second derivative of the pressure coefficient at the leading
edge.

In Part II the axially symmetrical flow around ogives of revolution is treated. A procedure for obtaining correct successive approximations to the flow in the tip region is indicated. The first approximation is worked out in detail and it is shown that the mathematical singularity of the first approximation near the surface of the ogive, which caused complications in a previous treatment of the problem, is avoided by the introduction of Crocco's stream function.

88 pages. \$2.00. Mic 57-918

ENGINEERING, CHEMICAL

A STUDY OF ALKYD-SILICONE COATINGS

(Publication No. 19,446)

Aziz F. Abdul-Karim, Ph.D. Purdue University, 1956

Major Professor: R. A. Morgan

The purpose of this investigation was to make a basic study of silicone-alkyd copolymers and their application in high temperature surface coatings.

Alkyd resins were prepared by esterifying a dibasic acid and a monobasic acid with a polyhydric alcohol in quantity equivalent to the total acids and to the ethoxy content of the silicone at a temperature of $380^{\circ}-450^{\circ}F$. under an inert atmosphere, agitation, and azeotropic reflux in a solvent until the acid number had decreased to 10. A silicone was then copolymerized with the alkyd. The silicone-alkyds were evaluated as varnishes and enamels.

The limiting ratios of the silicone and alkyd components were determined in a system using phthalic anhydride, 2-ethylhexoic acid, trimethylol ethane, and phenylethoxy polysiloxane. Optimum compositions of copolymers were found to be between 50 to 60% silicone and a dibasic to monobasic acid ratio close to 2.

The monobasic acid was found to be, thermally, the weakest constituent of the alkyd and its chain length had a pronounced effect on the thermal stability and flexibility of the copolymer. While increasing chain length tended to increase the flexibility of the resin film, the greater decomposition of the longer-chain acids resulted in inferior enamel properties. On the other hand, the greater

thermal stability attained with a decrease in chain length was accompanied by the disadvantage of inferior flexibility and limited compatibility. It was found further that the decomposition of the monobasic acids was an oxidation phenomenon.

In substituting various glycols for trimethylol ethane flexibility was increased but thermal stability was found to decrease with increase in glycol chain length. Neopentyl glycol was found to be the best of the glycols studied. It had sufficient thermal stability to permit its use in silicone-alkyd resins for a service temperature of 450° F. or less. The limited thermal stability of the glycols precluded their use at higher service temperatures.

Comparative studies of the isomeric phthalic acids as constituents of the alkyd component were made. Copolymers containing these acids showed slight differences in enamel properties at exposure temperatures of 450° F. or below. At 500° F. resins containing phthalic anhydride began to show signs of film failure; at 500° F. resins containing terephthalic acid showed similar failure. Resins containing isophthalic acid showed the best thermal stabilities and were able to withstand successively 100 hours at 450° F., 100 hours at 500° F., and 100 hours at 550° F. while retaining film integrity, gloss above 80, good color, adhesion, alkali and solvent resistance and a fair degree of flexibility.

Silicones with an ethoxy content of from 15 to 25% gave optimum copolymers with the alkyd resins; i.e. no processing difficulties, good compatibility and superior thermal stabilities. Evidently, there is an optimum range of silicone chain length and functionality which permits a more uniform distribution of the alkyd and silicone chains in the copolymer and results in a resin that combines best the properties of the two components.

It was further learned that aryl silicones produce silicone-alkyd resins of superior thermal stability but of limited flexibility and adhesion. On the other hand, alkylaryl silicones produce silicone-alkyd resins of superior flexibility, adhesion and impact resistance. However, improvement in these properties was brought about at a considerable sacrifice in thermal stability, gloss and gloss retention which are important properties in high temperature surface coatings.

Some copolymers made during this investigation were found to be superior with respect to maximum service temperature and at least equal in other properties to any presently known commercial product.

196 pages. \$2.55. Mic 57-919

A QUANTITATIVE EVALUATION OF THE EFFECT OF EDGE LOSSES AND CONTACT RESISTANCES IN THE DETERMINATION OF THERMAL PROPERTIES OF SOLID MATERIALS BY AN UNSTEADY-STATE METHOD

(Publication No. 20, 186)

Arthur Alexander Armstrong, Jr., Ph.D. North Carolina State College, 1957

Supervisor: Kenneth Orion Beatty, Jr.

Unsteady-state methods were proposed for the determination of thermal diffusivity and thermal conductivity

of low conductivity materials at high temperature. Mathematical solutions were obtained for these unsteady-state methods using the boundary conditions actually produced experimentally. These mathematical solutions were used to determine the thermal diffusivity and thermal conductivity from time-temperature data obtained in the unsteady-state processes. Values of the specific heat were determined from the values of thermal diffusivity, thermal conductivity and density using the definition of thermal diffusivity.

Thermal diffusivity was determined from time-temperature data obtained during the unsteady-state heating of two identical circular slab ceramic samples placed between two graphite heating platens with the sample edges losing heat to a surrounding ring of high conductivity graphite maintained at constant temperature t_0 . Then the heating platen temperatures were raised linearly with time to a higher constant temperature T_0 .

The two parameters used for the calculation of thermal diffusivity depended upon the heat transfer coefficient between sample and platen surface, heat transfer coefficient between sample edge and surrounding ring, and the thermal conductivity of the sample. Charts were constructed from the mathematical solution relating the temperature at two points in the sample at steady-state for various values of the two parameters. Values of the two parameters were then determined from a chart by using the temperatures measured at two points in the sample at steady state.

Thermal conductivity was determined from a similar unsteady-state process. The only difference was that an absorber of high conductivity graphite was placed between the two identical ceramic samples. Thermal conductivity was calculated from time-temperature data obtained during the unsteady-state heating by using the heat transfer parameters and thermal diffusivity determined in the diffusivity run and the transcendental equation for the mathematical solution of the temperature in the graphite absorber.

Thermal diffusivity, thermal conductivity, and specific heat were determined by the proposed methods on three sets of samples of one alumdum material: Norton RA139. Temperature ranges used in the experiments were 800-900°F, 1000-1100°F, and 1200-1300°F. Experimental runs were made in triplicate on each set of samples and at each temperature range.

As a measure of the accuracy of the results the experimental values of specific heat were compared with values from the literature. (Since Norton RA139 is over 99% aluminum oxide values of specific heat of aluminum oxide from the literature were used for comparison.) Deviation from the literature values were 1.1%, 4.6% and 9.1% respectively, for the temperature ranges 800-900°F, 1000-1100°F and 1200-1300°F. This close agreement between values of specific heat indicates good results in determining thermal properties by these methods.

179 pages. \$2.35. Mic 57-920

HIGHER ALCOHOLS IN THE ALCOHOLIC DISTILLATION FROM FERMENTED CANE MOLASSES

(Publication No. 18,730)

Herminio M. Brau, Ph.D. Louisiana State University, 1956

Supervisor: Professor Arthur G. Keller

Fusel oil is the name given collectively to a mixture of alcohols higher in molecular weight than ethanol, obtained as by-products in the alcoholic fermentation industries. Iso-amyl, active-amyl, iso-butyl and n-propyl alcohols are generally the main constituents of fusel oil with n-amyl, n-butyl and iso-propyl alcohols generally present in lesser amounts. In addition, minute amounts of a wide variety of organic substances appear as impurities in the fusel oil by-product.

The main constituent alcohols of fusel oil are derived from amino acids present in the mash and formed by autolytic breakdown of the proteins of the cells themselves. The origin of n-butyl and iso-propyl alcohols is traced to the action of butyric acid bacteria on sugar.

The composition of fusel oil and the amount produced in any particular fermentation depends on the kind of substrate utilized, nitrogen source present, nature of the microorganism employed, time and temperature of fermentation process, and contaminations present in the mash.

Fusel oil is used commercially as a solvent, frother agent, antifoaming agent, and as process material in the chemicals industry. Amyl acetate is the most important derivative of fusel oil.

A review was made on the various methods of analysis available for the determination of fusel oil. The A.O.A.C. procedure, based on the Allen-Marquardt method, reports only about 60% of the true fusel oil present. Colorimetric methods, based on Komarowsky's reaction possesses greater accuracy and sensitivity and are less time consuming.

The presence of fusel oil over certain limits in alcoholic beverages and industrial alcohol detracts from the quality of the product. In continuous distillation process the oils are separated as a side-stream from an intermediate region of the rectifying column.

In this work experimental data have been gathered on fusel oil distribution in the rectifying column under different operating conditions. These data can be used for design purposes and for the selection of operating conditions in commercial practice in order to produce distillates of definite specifications.

The experimental results obtained indicate that: (1) the location of the plate of maximum accumulation is a function of the reflux ratio utilized and the alcohol content in the feed; (2) under the operating conditions studied, a single peak of fusel oil accumulation occurs and it is always above the feed plate in the region where the apparent alcohol content is from about 130° to 140° Proof; (3) the width of the fusel oil band is a function of the operating conditions utilized; (4) different concentrations of fusel oil occur in plates of similar alcohol content under different operating conditions; (5) variations in the content of fusel oil in the feed do not cause a shift in the location of the plate of maximum concentration; (6) reflux ratios of 2:1 or below do not produce predominant accumulations in any

region of the column; distillates very high in fusel oil are produced; (7) there is no fusel oil present in the alcoholexhausted plates in the bottom of the column.

An automatic control system was developed for the operation of continuous distillation columns in the alcoholic distillation, based on varying the rate of feed to maintain constant a reference temperature in the column.

Graphs were prepared, based on experimental data, for determining true alcohol content in samples containing large concentrations of fusel oil.

Liquid-vapor equilibrium data for the system ethanolwater at one atomosphere was compiled in a single tabulation which gives the equilibrium compositions for both phases in terms of per cent by weight, mol fraction and per cent by volume at 60°F and 20°C. Direct conversions between the various terms can be readily made.

271 pages. \$3.50. Mic 57-921

THE IRRADIATION OF POLYVINYL METHYL ETHER WITH ELECTRONS AND GAMMA RAYS TO FORM ELASTOMERS

(Publication No. 19,656)

Dick Duffey, Ph.D. University of Maryland, 1956

Supervisor: Dr. Wilbert J. Huff

Polyvinyl methyl ether, which is a commercially available relatively inert viscous tacky material, was irradiated with electrons from a Van de Graaff accelerator and gamma photons from a cobalt 60 source. This treatment was on the pure ether and on mixtures of the ether with a variety of filler powders, which included carbon black, magnesia, silica, iron oxide, calcium phosphate, calcium carbonate, clay, zinc oxide, rutile, chromium sesquioxide, litharge, antimony trisulfide, zinc sulfide, barytes, zircon, calcium fluoride, antimony trioxide, and zinc borate.

The ether cross linked, which was evidenced by swelling in the usual solvents and disappearance of the melting point. Several of these fillers, particularly carbon black, magnesia, silica, iron oxide, and calcium phosphate, very significantly reinforced the product to yield elastomers. Ordinary chemical methods for cross linking, or vulcanization, were ineffective.

In general, the amount of filler for optimum strength was about 30 per cent of the mixture by volume. Tensile strengths of over 1500 psi with elongations of 100 to 200 per cent were obtained. This is about as high as that shown by the natural and synthetic rubber which has recently been vulcanized by radiation experimentally. Certain mixtures, which were those with less filler surface area, gave bubbly products on irradiation, and either a higher concentration of filler or heat treating the mixtures prevented bubbling. Some dielectric constants and dielectric dissipation factors were measured.

The elastomers formed from polyvinyl methyl ether compared favorably in physical properties with many ordinary elastomers, and some were superior in strength and elongation to silicone and thiokol rubber. Since the ether is soluble in water, probably all the elastomer products would swell in water to some extent, and this could be a

serious disadvantage to most uses. Detailed development would be expected to improve properties shown by the preliminary products. It is notable that the raw materials for polyvinyl methyl ether are basically coal, limestone, air, and water and relatively few steps are involved in processing to the cross linked polymer. Also the better fillers are readily available. This might lead to some processing advantages over other elastomers.

Although very large amounts of radiation will be needed in the commercial application of these results, such amounts will probably be available when nuclear power becomes commercial. 158 pages. \$2.10. Mic 57-922

BATTERY STUDIES WITH PARTICULAR REFERENCE TO ORGANIC DEPOLARIZERS

(Publication No. 17,814)

William Lamon Monson, Ph.D. University of Maryland, 1956

Supervisor: Professor Wilbert J. Huff

Since Volta's invention of the first primary cell, using silver and zinc, numerous other cell combinations have been studied, covering a wide variety of anode and cathode materials. The latter have included both inorganic and organic substances capable of electrochemical reduction, although, historically, organic cathode materials have received very much less attention than the inorganic.

It was the purpose of this investigation to study the actual behavior of a selected number of quinones as depolarizers in primary cells. Performance of experimental cells was compared with cells of the usual dry cell composition but of the same size and construction as cells of experimental composition.

The results show that certain substituted anthraquinones possess good depolarizing ability as measured by discharge voltage and coulombic capacity. Energy output in some cases was higher than that of the manganese dioxide control cells (zinc anodes in all cases) because of higher effective coulombic capacities.

A qualitative study of the effect of substituents on the discharge voltages of various quinones showed that cell working voltages were much more sensitive to quinone substitution than were the calculated reversible potentials. Also, in the case of nitro- substituted anthraquinones more coulombic capacity was obtained than could be accounted for by the simple reduction to the corresponding hydroquinone. The possibility of a reduction of the nitrogroup of this compound was considered.

Substances investigated were benzoquinone, naphthoquinone, anthraquinone, and certain of their derivatives, using various electrolytes.

The size of the experimental cells was such that about 0.2 gram of the various depolarizers could be studied conveniently. 207 pages. \$2.70. Mic 57-923

KINETICS OF THE ACID CATALYZED CONVERSION OF XYLOSE TO FURFURAL

(Publication No. 20,259)

Donald Francis Root, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Wayne K. Neill

The objective of the research was to produce a thorough chemical kinetics study of the conversion of xylose to furfural over a wide range of experimental variables. The program design included studies in six categories: (1) the kinetics of xylose disappearance and simultaneous appearance of furfural in aqueous sulfuric acid; (2) the kinetics of furfural disappearance in aqueous sulfuric acid; (3) the effect of the presence of glucose on yields of furfural from xylose; (4) the effect of acetic acid as a catalyst; (5) individual experiments designed to elucidate the reaction mechanism; and (6) the effect of the presence of the halide ion on furfural yields.

Studies were carried out with batch samples, each approximately 0.25 ml. in volume, contained in ampoules made from 3 mm. Pyrex tubing. Samples were reacted in a constant temperature bath for various lengths of time and were analyzed for furfural and residual xylose to find their variation with time. Experimental and analytical procedures are described in detail with particular attention given to the heat transfer characteristics of an ampoule as it is heated to bath temperature.

The studies covered a range of temperatures of 160° C. to 280° C., at 20° C. intervals, and a range of acid concentrations from 0.8 to 0.00625 gm.-equivalents per liter. Initial xylose concentration was varied from 3.125 to 200 grams per liter.

The disappearance of aqueous acidified xylose followed a first-order mechanism. The rate constant was correlated with temperature by means of the Arrhenius equation, and an activation energy of 33,560 calories per gm.—mole was found. The rate constant varied directly with acid activity. An equation expressing the rate constant as a function of temperature, acid concentration, and initial xylose concentration is given.

Aqueous acidified furfural followed an apparent first-order decay, although the rate constant varied with initial furfural concentration. An equation relating the rate constant to temperature and acid concentration at an initial furfural concentration of 0.0478 gm.-moles per liter is given.

Furfural yields from xylose followed a growth and decay with time. Experimental data clearly indicated the occurrence of a second-order side reaction between furfural and a furfural precursor. An equation is developed which expresses furfural concentration as a function of time for the entire range of experimental conditions. Except at very low acid concentrations where yields diminished, apparently because of hydroxyl ion-catalyzed destruction of xylose, the maximum yield of furfural was independent of acid concentration. However, the time at which maximum yield occurred was inversely proportional to acid activity. Effects of temperature and initial xylose concentration are summarized in a graph in which maximum furfural yield is plotted as a function of temperature with parameters of initial xylose concentration. At an initial xylose concentration of 100 gm. per liter, the yield

increases from 35.2 percent of theoretical at 160° C. to 67.5 percent at 280° C. At 200° C., the yield increases from 42.8 percent of theoretical at an initial xylose concentration of 200 gm. per liter to 68.2 percent at an initial xylose concentration of 3.125 gm. per liter.

Studies of the effect of the presence of glucose showed that maximum furfural yield was reduced by about 13 percent at 160° C. when glucose and xylose were present in equal amounts; at 240° C. the reduction in yield was negligible. Studies with acetic acid used as a catalyst revealed that the catalytic strength was very low. When sodium chloride was added to aqueous xylose, acidified with sulfuric acid, maximum furfural yield increased toward the same upper limit that was obtained when initial xylose concentration was reduced.

299 pages. \$3.85. Mic 57-924

NATURAL CONVECTION HEAT TRANSFER IN REGIONS OF MAXIMUM DENSITY

(Publication No. 18,961)

Robert Samuel Schechter, Ph.D. University of Minnesota, 1956

Theoretical equations are derived which predict the heat transfer coefficient when a convection process is occurring in a region of maximum fluid density. One of two flow regimes can prevail when such a process is occurring; thus precluding the development of a unified theory.

Two equations were developed:

$$\overline{Nu} = 0.892 \left[\overline{Gr'} \left(\frac{1}{3} + \frac{S_1}{5} + \frac{S_2}{7} \right) \right]^{1/4} Pr^{1/2} (0.952 + Pr)^{-1/4}$$

for the uni-directional regime, and

$$\overline{\text{Nu}} = 0.652 \left[\text{Pr } \overline{\text{Gr}} \left(\frac{1}{3} + \frac{S_1}{5} + \frac{S_2}{7} \right) \right]^{1/4} \frac{U^{3/4} - 1}{(U - 1)^{3/4}}$$

for the inverted regime.

The equations were checked experimentally by measuring the heat transfer from a flat vertical plate immersed in water. Velocity and temperature measurements were made in the liquid boundary layer.

In addition to the experimental and theoretical studies, numerical solutions to the differential equations were obtained by use of an analog computer.

157 pages. \$2.10. Mic 57-925

STUDIES OF LAMINAR PRE-MIXED METHANE-AIR FLAMES: THE FLAME ATTACHMENT ZONE AND FLAME PROPAGATION RATES ALONG A NICHROME SURFACE* (PARTS I AND II)

(Publication No. 20,163)

Arthur Louis Thomas, Ph.D. Princeton University, 1956

Present work has been concerned with the attachment of flames to surfaces, a subject of ultimate interest in the

stability properties of jet engine combustion chambers. Part I features the effect on flame properties of the compositional control of the flame attachment zone, taken together with a group of geometric considerations. Part II is concerned with the effect of surface temperature on flame propagation velocities along a Nichrome surface.

Part I.

Flame blowoff, flashback and extinction characteristics for laminar methane-air systems stabilized in various inert and oxidant atmospheres and stabilized in air with oxidant, inert or combustible issuing into the zone of flame attachment have been determined.

The salient finding is the observation that the blowoff limit of a laminar, pre-mixed hydrocarbon-air flame may be increased greatly through the introduction into the zone of flame attachment of auxiliary combustible (hydrocarbon, hydrogen) or auxiliary oxidant (oxygen). The amount of auxiliary gas introduced in close vicinity of the flame attachment zone is extremely small for the achievement of major effects in the extension of the range of gas flow for a stable flame. Thus, as little as five per cent of the main stream methane flow of a methane-air mixture when introduced through a slot near the flame attachment point, is found to increase blowoff limits as much as sixfold.

Local introduction of inert gases such as carbon dioxide, helium and nitrogen in the attachment zone depressed the blowoff stability limits; these results are consistent with previous results when pre-mixed flames were burned in atmospheric environments of inert gases.

The extension of blowoff limits by attachment zone composition control has been extended in preliminary experiments to turbulent flames attached to bluff body holders.

The method of extension of blowoff stability differs in a major sense from flame stabilization with a pilot flame. In a pilot flame the stability of the main flame in the zone of attachment is increased through the transfer of heat from the pilot light. In present work increased stability is achieved through enrichment of gases in the attachment zone by the introduction of auxiliary gases through mass transfer. A pilot light commonly is supplied with mixed combustible and oxidizer gas and it maintains itself independent of conditions in its environment. In the present procedure the auxiliary gas must first mix with other gases in the attachment zone before they can participate in the local combustion processes.

Part II.

There have been conflicting results on the influence of temperature in the velocity of combustion. It is of interest to measure the temperature functionality of flame velocity using a technique different from previous works. A dynamic system whereby the flame propagates from one end to the other of a long slot burner was chosen, in which the propagating velocity is a measure of the burning velocity as given by the static systems. The surface temperature was varied from room temperature to over 300°C. The possible effect of pre-propagation surface conditioning at elevated surface temperatures in the turbulent composition range of propagation rate in order to detect instabilities in the average propagation rate as a function of surface conditioning was also studied.

The rate of flame propagation increased with surface temperature. The propagation velocity for a 12.4%

pre-mixed methane-air mixture increased from 63 cm/sec at 25°C to 132 cm/sec at 300°C.

A statistical design experiment indicates that in the region of turbulent flame propagation, the average rate of propagation is constant for a given surface temperature, gas flow rate and composition, independent of prepropagation surface conditioning.

229 pages. \$3.00. Mic 57-926

*This research was supported by the United States Air Force under Contract No. AF 33(038)-23976 monitored by the office of Scientific Research.

OXIDATION PROCESSES IN THE RECOVERY OF SULFUR DIOXIDE FROM WASTE GASSES

(Publication No. 19,884)

William Ernest West, Jr., Ph.D. University of Illinois, 1956

The oxidation of ammonium sulfite-bisulfite solutions was studied using air at atmospheric pressure and oxygen gas at pressures from two to eight atmospheres. The oxidation with oxygen produces ammonium sulfate and sulfur dioxide gas. Oxidation with air produces ammonium sulfate and a gas containing 8 to 12 percent sulfur dioxide which is suitable for the manufacture of sulfuric acid.

The oxidation by air was studied by bubbling air through porous plate under a 34-mm. glass column filled with solution to depths of 90 to 100 cm. The rate of absorption and reaction of the oxygen was determined by measuring the inlet air rate and the ratio of oxygen to inert gases in the exit gas. The interfacial area was estimated from the size of the bubbles and the gas holdup volume. The mean partial pressure of oxygen was estimated from the mean total pressure, the rate of absorption and the equilibrium partial pressure of water. The results are reported in terms of an absorption coefficient, K_G, pound moles of oxygen per hour per square foot of interfacial area per atmosphere of partial pressure of oxygen. At 30°, K_G varied from 1 x 10⁻⁵ for concentrated solutions to 25 x 10⁻⁵ for dilute solutions. At 90°, K_G increased by a factor of 2.5. The presence of 14 p.p.m. of ferrous ion or 500 p.p.m. hydroquinone had a very small effect on the rate of oxygen absorption. The smaller rate of oxygen absorption in concentrated solutions is apparently the result of the lower solubility of oxygen.

Oxidation by oxygen gas was studied by bubbling the gas through a 2.6 in. by 18 in. stainless steel reactor filled with solution. The results with oxygen agreed with those for air.

An estimate was made of the costs of oxidation processes for the recovery of 100 tons of sulfur dioxide per day based on the use of conventional gas-liquid contacting equipment and the production of acid from all of the sulfur dioxide recovered. This indicated that these processes would be more expensive than the alternate process of adding sulfuric acid to the solution to produce ammonium sulfate and sulfur dioxide gas which is used to produce sulfuric acid in excess of that used to acidify the solution.

107 pages. \$2.00. Mic 57-927

ENGINEERING, CIVIL

BUILT-UP COLUMN STRENGTH

(Publication No. 20,311)

Yuzuru Fujita, Ph.D. Lehigh University, 1956

Commencing about the middle of the 20th century, considerable attention was given by research workers to the problem of obtaining the true ultimate strength of metal columns with residual stresses. In this dissertaion, the ultimate strength of a column with arbitrary residual stresses is determined. As a general solution, a graphical method is developed. A "modified Shanley model" is also presented to estimate quickly the maximum load of a column with arbitrary residual stresses, computed either on the basis of the residual stresses or on the data from a cross-section (stub column) test.

Columns built up of rolled shapes and plates or by the welding of plates will necessarily contain residual stresses. Therefore, the influence of the magnitude and distribution of residual stresses (or the shape of the average stress-strain curve in a "cross-section" test) on column strength is studied.

In the case of unsymmetrical residuals, a column may show torsional behavior. The load-deflection characteristics and combined torsional and flexural buckling are also studied for certain assumed conditions.

Welding residuals are studied by a graphical method and the calculations are compared with test results which were obtained during actual welding operations. The calculations and tests show fair agreement and a correlation that is adequate to clarify the mechanism of residual stress formation during welding.

Welded and riveted columns (as typical examples of built-up columns) are investigated. To obtain experimental correlation, residual stresses were measured, four cross-section tests were made, and five built-up columns of varying slenderness ratios were tested.

It is concluded that under the existence of considerable residual stresses like cooling residuals or welding residual stresses, the ultimate load could be considerably higher than the tangent modulus load. Therefore, the tangent modulus load might be too conservative. Even so, the tangent modulus theory as applied to a cross-section test is still applicable in design practice for ordinary built-up columns. By taking into account the actual residual stress pattern a more exact solution may be obtained which includes not only the tangent modulus load but the ultimate strength as well.

175 pages. \$2.30. Mic 57-928

APPROXIMATE ANALYSIS OF DOMES

(Publication No. 19,866)

Robert Schmidt, Ph.D. University of Illinois, 1956

The object of the dissertation is to initiate the development of new numerical methods for the analysis of symmetrically loaded domes having the form of a surface

of revolution, as well as to make a brief study of the application of the method of finite differences to the same problem. Primary emphasis is placed on the elastic analysis of domes of such proportions that the resulting deflections may be considered as small in comparison with the thickness of the dome. The methods presented reduce the problem of the analysis of domes to the solution of a system of simultaneous linear algebraic equations. The analysis of domes exhibiting large deflections is also discussed, but rather briefly.

The first two methods are based on the concept of a finite double element isolated from the dome by two adjacent meridian planes and two conical surfaces generated by revolution about the dome axis of the principal radii of curvature at points n + 1 and n - 1 on a meridian. The internal and external distributed forces and moments are then concentrated at the three nodes of the double element, and the equations of equilibrium are derived by taking summations of the concentrated forces and moments in chosen directions. The first of the two methods utilizes the displacements in meridional and normal directions as the two necessary dependent variables which are related to the internal forces and moments by means of Hooke's Law and the geometry of the deformed double element. The second method makes use of the rotation of the meridian and the increase of the radius of the latitudinal (parallel) circle as the two dependent variables. This method is a little less laborious than the first one. The two methods can be applied with advantage to several types of domes and loading conditions.

Next is presented a procedure for the application of finite differences to the analysis of domes with constant and variable meridional curvature. It is illustrated by means of an example of a dome whose meridian is a cycloid. This procedure is believed to be simpler and more straightforward than the procedures used by earlier investigators. Also a brief comparative study is made of the application of finite differences to the analysis of a spherical dome.

Finally a method is suggested which makes it possible to determine the displacements and stresses in domes exhibiting moderately large deflections. It is a variety of the method of successive approximations. The first approximation may be obtained by solving the problem as if the deflections were small. The numerical value of the displacements thus obtained are then substituted in the finite-difference equations for all the multiplicands but one in the higher-power terms involving displacements. In this way a system of simultaneous linear equations is obtained. Its solution is the second approximation. The process is repeated till sufficient accuracy of the results is obtained.

110 pages. \$2.00. Mic 57-929

A STUDY OF PRESTRESSED METAL STRUCTURES FOR BUILDINGS

(Publication No. 19,868)

James Redding Sims, Ph.D. University of Illinois, 1956

The study consists of consideration of structural members which have stresses introduced into them

through the attachment of a tendon carrying load. This tendon is normally a group of high strength steel wires or a high strength alloy steel rod. The goal desired is an initial stress which combined with the stress produced by load on the structure will produce a more favorable distribution of stress in the member and hence allow a lighter structure to result.

An economy in weight may be effected in a tension member if the material in that member is initially placed in compression by means of a high strength wire tendon permanently attached to the member. This study clearly shows that this saving in weight cannot be obtained without either reducing the factor of safety or allowing an increased elongation.

Simple Beams and Trusses may be prestressed effectively by attaching a high strength wire tendon in a configuration conforming to the ordinates of the moment diagram of the forces to be counteracted by prestressing. It is essential that provisions be made to carry axial load in the beam or truss as a consequence of the stressing of the tendon. Design procedures to allow treatment of Dead and Live Load are discussed. Weight savings on the order of 15% are shown to be possible by this prestressing technique. Due to the amount of structural detail which must be fabricated into the structure this technique is likely to be limited to long span structures as characterized by boxgirders and trusses.

A review of the technical literature reveals a deficiency in information concerning certain physical properties of the material which may be used in prestressed construction. The whole question of the safety of structures prestressed with heat-treated wire must be critically reviewed. Quantitative information must be evaluated with regard to the stress relaxation characteristics of cold-drawn and heat-treated wire. The elastic properties of strand composed of varying members of wires need to be investigated.

This study is primarily of an analytical nature and results in the conclusion that certain structures will be improved by prestressing. However, prestressed metal structures should be subjected to laboratory investigation to determine their load-carrying capacity, mode of failure and general behavior under load before being incorporated into structures in which human life might be endangered.

93 pages: \$2.00. Mic 57-930

THE LATERAL-TORSIONAL BUCKLING OF YIELDED STRUCTURAL STEEL MEMBERS

(Publication No. 20,312)

Maxwell William White, Ph.D. Lehigh University, 1956

The dissertation has the specific purpose of developing design procedures and/or rules for determining the critical length for lateral-torsional buckling of a WF beam which is subject to various degrees of inelastic deformation, such as occurs in the 'plastic hinge' region of a structure being designed for its ultimate strength by plastic design methods.

From considerations of the non-homogeneous yielding of structural steel it is shown that the material is

characterized by its elastic state or its strain-hardened state and their corresponding moduli. Solutions are therefore obtained for the differential equation of a number, loaded by end moments and shears (defined by moment gradient), for various boundary conditions and extent of the region of strain-hardening by introducing the appropriate moduli. The solutions are obtained on the basis of a finite difference approximation.

Examination of the behavior of an actual structure leads to the expression of this extent of strain-hardening from the required abrupt angle change and moment gradient of member. Based on these results a design procedure is described, the necessary information being given in graphical form. Design examples are given and the results compared with previous work developed by a totally different method.

177 pages. \$2.35. Mic 57-931

THE CONTROL OF TEMPERATURE STRESSES IN CONCRETE GRAVITY DAMS

(Publication No. 19,891)

George Allen Young, Ph.D. University of Illinois, 1956

One of the most difficult problems to be resolved in the design and construction of large concrete gravity dams is the control of temperature stresses which develop within the concrete mass from the hydration of the cement and from climatic changes. Most of the developmental work on this subject has been sponsored by the few organizations responsible for the design and construction of the large concrete gravity dams in this country. Each organization has considered the problem and has apparently arrived at a satisfactory solution. A comparison of the solutions, however, reveals noticeable differences. How many of these differences are due to gradual improvements in construction procedures, to different site conditions, or to personal preferences of the design authorities has never been established. This thesis provides a critical analysis of the overall temperature control problem and an outline of a complete and orderly design procedure for determining the temperature control requirements of a proposed dam.

In presenting the material, it was recognized that the designer would need the following in the order indicated:

- 1. A knowledge of why and how current temperature control procedures have developed.
- A complete understanding of the cause of temperature stresses in dams.
- 3. A thorough knowledge of the fundamental factors which define the problem at a given dam site.
- 4. A working hypothesis for establishing permissible temperature changes for design.

These requirements provided the basic outline for the thesis except for the final chapter where a simplified problem was presented to contrast a new temperature control procedure with the conventional.

315 pages. \$4.05. Mic 57-932

ENGINEERING, ELECTRICAL

ELECTRICAL PHENOMENA IN
THE PRE-BREAKDOWN REGION OF Cds CRYSTALS

(Publication No. 18,368)

Nouriddin Abdulla Al-Rubayi, Ph.D. The University of Wisconsin, 1956

Supervisor: Associate Professor R. C. Retherford

The behavior of the steady state dark current and the pre-breakdown pulses superposed on this current have been investigated in CdS single crystals as a function of electric fields somewhat below breakdown value.

The occurrence of the pulse is regarded as a sudden change of the crystal resistance from a high to a low value. Two kinds of pulses are observed, one bigger in magnitude than the other. The pulse magnitudes are found to increase with the voltage applied across the crystal. The rate of appearance is found to increase with the applied voltage for the small pulses, and that of the large pulses is found to increase up to a certain voltage and then decrease with further rise of voltage. The origin of the pulses is not known at present; however, the steady state dark current is found to be a form of space charged limited current. A reasonable model is constructed wherein electron traps are assumed to be situated at 0.4 e.v. and hole traps at 1.35 e.v. below the conduction band edge. The values obtained for the parameters N_t (electron trap density), N_A (hole trap density), and W_F (the Fermi level) are in good agreement with what has been found so far about CdS crystal properties.

79 pages. \$2.00. Mic 57-933

ASPECTS OF THE LINEARIZED EQUATIONS OF AIRCRAFT MOTION USED IN FLIGHT CONTROL SYSTEM DESIGN

(Publication No. 19,639)

Andrew Wahlert McCourt, Ph.D. University of Pittsburgh, 1956

Certain aspects of the dynamic equations of motion of an aircraft, which may lead to ambiguities in the course of flight control system design, should be clarified. These aspects arise from the plurality of systems of axes and definitions of dependent variables which the control systems engineer may use, and from the lack of correlation between these items and the equations of motion in available references. The form of numerical aircraft characteristics presented to the controls analyst by the aerodynamicist varies among airframe manufacturers. Further, during flight control synthesis it is desirable to use various types of equations to investigate different aspects of aircraft-control system dynamics. Therefore there is a problem to ensure the consistency of the axis systems, the variables, the structure of the equations of motion, and the aerodynamic parameters.

To treat complex nonlinear systems conveniently under limited conditions, they may be linearized. Linearization of the aircraft dynamics introduces the concepts of steady

state values and incremental or differential variables. Stability derivatives are defined as partial derivatives of aerodynamic forces and moments with respect to aircraft motion, and enter into the constant coefficients which together with incremental variables form linearized equations of motion. The system may then be analyzed by means of classical methods of dealing with linear differential equations with constant coefficients, or by means of operational calculus. Many techniques based on investigating the roots of the characteristic polynomial of such a system may be applied.

In accord with basic principles for analyzing the dynamics of a rigid body, the aircraft equations are initially written in a coordinate system fixed to the airframe. It is also convenient to use a system of axes defined with respect to the airflow or velocity vector, because of the more direct applicability of experimental wind tunnel data, and because of the ease with which constant altitude steady state flight may be set up as a special case.

In order to establish the desired relationships, the entire derivation of kinematic and dynamic equations is conducted rigorously and in logical sequence. The two main viewpoints taken are, first, that linearized equations are developed by mathematical simplification of the non-linear equations, and second, that linearized wind-axis equations are obtained by a trigonometric rotation of the linearized body-axis equations. In neither case is any attempt made to deduce the new equations from simplified pictorial representations of the problem.

It is shown that three distinct sets of incremental angular displacements must be defined for complete understanding of lateral motion. These are incremental angles of orientation, body-axis angles, and wind-axis angles. The coefficients in the lateral equations, especially in the side force equation, depend on the selection among these variables.

The rigorous definitions of azimuth and flight path angles provide indications of the limited conditions under which certain simplified equations for these quantities hold. Further, a rigorous basis is provided for writing a linearized azimuth in terms of the various lateral angles.

It is shown that the correct coefficients in the linearized longitudinal equations derive inherently from the process of equation rotation. Several of these coefficients involve functions of steady state lift, drag, and flight path angle. The significance of retaining these complex terms is more in the ability gained by the control systems engineer to freely convert between various systems of equations, axes, and aircraft data, than in the insurance of numerical exactness.

In the course of the development of longitudinal equations, it is further shown that the wind axes may be either fixed to the instantaneous velocity vector or fixed to the aircraft at the steady state airflow direction, withoug effect on the results.

110 pages. \$2.00. Mic 57-934

ANALYSIS AND DESIGN OF CERAMIC TRANSFORMERS AND FILTER ELEMENTS

(Publication No. 19,389)

Charles Abraham Rosen, Ph.D. Syracuse University, 1956

Two classes of electromechanical devices with a common physical basis, ceramic power transformers and ceramic filter elements are described, analysed and methods of design are formulated. Long thin bars made of piezoelectric ceramic material, such as polarized barium titanate, are fabricated as two terminal-pair devices. Energy is transferred from one terminal pair to the other via a conversion from the electrical to the mechanical form and vice versa, maximum energy transfer occurring when the bar is vibrating resonantly in one of its many possible longitudinal modes. A high-voltage, step-up transformer with moderate power-handling capability may be designed by suitable choice of the bar geometry and electrode placement. Radio filter elements, operating in the frequency range of approximately 15 to 500 kilocycles per second with high effective electrical quality factor, QE, and low insertion loss may also be fabricated using similar principles.

Based on equivalent electrical circuits representing the combined electrical and mechanical behavior of these bars, two selected geometrical configurations are analysed to determine: (1) Design criteria for a voltage stepup power transformer (2) Design criteria for a single element radio filter. Experimental verification of some important results is given.

For completeness, other configurations of ceramic transformers and filter elements are described including composite arrangements making use of rods or reeds of magnetostrictive ferrite material mechanically bonded to similar pieces of piezoelectric ceramic material.

174 pages. \$2.30. Mic 57-935

ENGINEERING, HYDRAULIC

DIVIDED FLOW THROUGH A DIVERGENT INLET CONDUIT

(Publication No. 20,065)

Stavros Tsakonas, Ph.D. Columbia University, 1956

This paper is concerned with the most efficient way to divert a portion of a main flow for auxiliary purposes which is of interest in the design of power installations, navigating locks, irrigation systems, etc. Experiments have shown that the losses incurred in dividing a flow are primarily a function of the relative inclination of the divided flow to the main flow at their junction; further there exists a unique inclination for which, all the other factors being constant, the losses are a minimum.

The objective of this investigation is to determine the parameters affecting this natural angle and other flow characteristics and further to study their influence on the

diverted jet. More specifically, the main goal of this investigation is to determine the influence of the velocity distribution in the upstream inlet part of a conduit on the natural angle and other flow characteristics.

In the experimental part of this investigation a divergent inlet conduit is used as a convenient means of altering the velocity distribution. To reach a definite conclusion on the influence of the velocity distribution the influence of the angle of divergence of the inlet conduit on the natural angle is determined theoretically in advance.

The theoretical part of this investigation deals with two models. One is a two-dimensional conduit of constant cross-section which has a rectangular slit in one side causing part of the flow to issue from the slit in the form of a well-defined jet. The other is a conduit with a divergent inlet section and a side opening at the end of the sloping part of the inlet section. Both cases are treated as problems in two-dimensional irrotational flow of an ideal incompressible fluid by means of the free streamline theory.

In the experimental work the same two cases of straight and divergent inlet conduits were tested under approximately two-dimensional conditions. The comparison of theoretical and experimental results for the straight conduit model serves to determine the degree of the validity of the free streamline theory and of the assumptions made. The second model with divergent inlet conduit is used to determine the influence of non-uniform velocity distribution.

The experimentally observed deviations from the theoretical solution for the case of the divergent inlet conduit are attributed to the influence of the velocity distribution. This is valid since all other parameters, namely, ratio of discharges, geometry of the opening and properties of the fluid are kept constant and only the velocity distribution varied in the divergent inlet case as compared with the straight conduit case.

The analysis is based on the free streamline theory, where the conformal transformations take advantage of the fact that the bounding stream lines are fixed straight lines along which the velocity is either constant in direction or constant in magnitude. By means of successive transformations the physical plane is transformed to hodograph plane to the logarithmic hodograph plane and finally by the Schwartz-Christoffel transformations to a ζ -plane, where physical properties of the flow pattern can be easily identified.

The determination of five unknown parameters $(\alpha, \beta, \gamma, \mu, \omega)$ which arise in the transformations used are obtained by relating known properties of the successive planes. Then all the flow characteristics may be computed, given the ratio of discharges (r) and the geometry of the fixed boundaries.

The flow characteristics and geometrical properties computed are: 1) θ the angle of the jet inclination from the downstream portion of conduit, 2) r, ratio of the discharge flowing thru the side opening to the total discharge at the inlet conduit, 3) h''/h', ratio of the width of the jet at infinity to the height of the main conduit, 4) 2/h', ratio of the side opening to the height of the main conduit, 5) c, contraction coefficient given by h''/l, 6) velocities at certain characteristic points of the field, 7) s, position of the stagnation point from the downstream edge of the slit.

Items (1) to (5) are investigated in detail whereas items (6) and (7) are given only in a general form. Closed form

solutions are obtained for items (1) to (5) for the case of the straight conduit as well as for the divergent inlet conduit with a small angle of divergence. However, for any angle of divergence $0 < \phi < \pi/2$ items (1) to (3) are only given in closed form.

The experimental results show very good agreement with the free streamline theory when the velocity distribution at the inlet conduit is uniform as is the case of the straight conduit. However, when the velocity distribution is non-uniform as for the case of the divergent inlet conduit the experiments show deviation from the theory but they remain similar in their general aspects.

The theoretical results together with the experiments show that the influence of the velocity distribution is more pronounced as the ratio of discharges increases, i.e. as more of the total discharge is conveyed thru the slit. Conversely, when most of the total discharge is conveyed thru the main conduit the influence of the velocity distribution diminishes. The following data give an indication of the order of magnitude of the influence of the velocity distribution: An angle of divergence of $\phi = 2^{\circ} 45' 48''$ which alters the velocity distribution slightly from uniformity lowers the angle of the jet by 1 1/2 to 4 degrees. The angle of divergence of $\phi = 6^{\circ} 25' 43''$, which alters the velocity distribution considerably, lowers the natural angle of the jet inclination by 2 1/2 to 6 degrees.

105 pages. \$2.00. Mic 57-936

ENGINEERING, MECHANICAL

AN INVESTIGATION OF TIME DEPENDENT THERMOELASTIC PROBLEMS USING INTEGRAL TRANSFORMS

(Publication No. 20,313)

David Maxwell Parke, Ph.D. Lehigh University, 1956

A large class of time dependent thermal stress problems are adequately formulated as quasi-static, linear elastic problems with temperature distributions governed by the theory of linear heat conduction. This contention is discussed; the linear thermoelastic equations are derived; and their well-known reduction to an isothermal problem by means of a displacement potential is discussed and presented.

The remainder of the essay is devoted to the presentation of three examples which illustrate a method, using integral transforms, to solve certain thermoelastic problems which depend on the time and two space variables. The method is as follows: The heat conduction equation and the Poisson equation for the displacement potential are transformed by a common multiple transform and the resulting subsidiary equations are solved simultaneously. The transformed displacement potential, so found, is used to calculate the transformed stresses; where necessary the condition of stress - free surfaces is met by removing the spurious surface stresses in the transformed region with an Airy Stress Function. Finally, only the required solution stresses need be inverted from their transforms.

The examples given as illustration are these:

A. An infinite solid heated internally by an impulse of "heat" generation in an infinitely long band, finite in width and vanishing in thickness. This problem is solved by using a triple Fourier exponential transform.

B. A semi-infinite solid heated on the surface by an impulse confined to an infinitely long band, finite in width. This problem is solved using a double Fourier exponential transform.

C. An infinite slab with one side held at the initial temperature and the other subject to a specified surface temperature change that is confined to an infinite band, finite in width. This problem is solved using a Fourier exponential transform followed by a finite sine transform.

67 pages. \$2.00. Mic 57-937

ENGINEERING, METALLURGY

A STUDY OF THE NOTCH SENSITIVITY OF THE WELD HEAT-AFFECTED ZONES IN SOME TITANIUM ALLOYS AND MN-MO ARMOR STEELS

(Publication No. 19,506)

John M. Gerken, Ph.D. Rensselaer Polytechnic Institute, 1956

Research Professor: Dr. Ernest F. Nippes

The notch sensitivity of weld heat-affected zones in six titanium alloys and four manganese-molybdenum armor steels was studied in this investigation. Impact specimens of each material were heat treated to simulate the actual weld heat-affected zone thermal cycles. Continuous cooling transformation diagrams of these alloys were determined to assist in understanding the effect of weld thermal cycles on these materials. The effect of energy input, initial plate temperature and post heat treatment on impact strength were studied for two of the titanium alloys. Charpy impact test results have indicated that decreasing the weld cooling rates by increasing weld energy input or by using a preheat improves the notch-toughness of the heat-affected zones. Post heat treatments in the range of 1200°F to 1250°F were effective in improving the impact strength of the least notch tough portion of the heat affected zone.

In general, the heat-affected zone for both titanium alloys and steels may be divided into three parts: (1) that which had not reached the lower allotropic transformation temperature; (2) that between the upper and lower allotropic transformation and (3) that above the upper transformation. In most cases the notch toughness either improved or remained the same as the unwelded material when the peak temperature was below the lower transformation. For the peak temperatures between the lower and upper transformation temperatures the impact strength generally decreased most rapidly with an increase in temperature. Above the upper transformation the impact strength tended to level off for titanium alloys and to improve first then level off for armor steels.

Of all the titanium alloys investigated, only the 6%Al - 4%V alloy was essentially unaffected by welding in regard to impact strength. The other titanium alloys were

seriously embrittled by weld thermal cycles. Post heat treatments involving transformation from beta to alpha plus beta at 1200°F was effective in restoring notch toughness to heat affected zones in some titanium alloys.

The effect of rare earth additions to armor steels was to increase the notch-sensitivity of the most notch-sensitive region of the heat-affected zone. No conclusive effect of boron on notch sensitivity was observed. The most notch-sensitive region of all the armor steels investigated was that point which reached a peak temperature of 1400°F. This temperature is between the upper and lower critical temperatures for these armor steels. Ferrite plus austenite of higher-than-average carbon content is formed on heating. The austenite subsequently transforms to martensite of greater hardness than a fully austenitized and cooled piece of the same material. The resulting structure of martensite plus ferrite exhibited a minimum impact strength. 148 pages. \$2.00. Mic 57-938

ADHESION AND BONDING OF COATINGS ON METALS

(Publication No. 19,508)

Wartan A. Jemian, Ph.D. Rensselaer Polytechnic Institute, 1956

Research Professor: Arthur A. Burr

The purpose of this investigation was to study the adhesion and bonding of metallic coatings on metals. The principal objective was to determine whether there are any cases of intrinsically poor adhesion or if all cases of poor adhesion may be ascribed to defects such as contamination.

A literature survey showed that adhesion literature is confined mainly to reports of adhesion tests. Pertinent literature was found in the fields of physical and mechanical metallurgy, electrochemistry, crystal structure, solid state physics, and electronics. Important papers from each field are listed and discussed.

A model was proposed to describe interfaces, in which it was assumed that the interface between two pure metals is analogous to that of a grain boundary with possible modifications caused by different crystal parameters in coating and substrate. In order to illustrate the model, the term "pure-interface" was defined as the bounding surface between two separately homogeneous phases that are in intimate contact, and a classification of pureinterfaces into types was made and illustrated by examples of known materials. The classification was based upon coherency, crystal structure, and chemical composition. This modified grain boundary model of a pure interface was tested by torsional creep recovery types of experiments. These showed that a twisted wire recovers at a rate that is approximately proportional to the logarithm of time, as predicted by Zener, and that transient effects may be caused by operations such as sudden attachment of an adherent coating, subsequent sudden removal of this same coating, and sudden removal of an adherent coating that was present during the initial twist. The magnitudes and directions of these transient effects are different but may be explained in terms of the interactions of slip dislocations with the interface. This behavior supports the grain boundary analogy.

A comparison of yield strengths and corresponding

dislocation densities is made to show that the yield strength of a grain boundary or other noncoherent pure-interface may be greater than the yield strength of either bounding phase with certain restrictions. Therefore, under the action of applied stresses of sufficient magnitude, inhomogeneous yielding will occur in these systems and lead to fracture within either base metal or coating and it is concluded that, under these conditions, the intrinsic adhesion of any pure-interface is good.

140 pages. \$2.00. Mic 57-939

THE RELATIONSHIP OF PLASTIC FATIGUE RESISTANCE TO MECHANICAL PROPERTIES AND MICROSTRUCTURE OF STEELS

(Publication No. 20,314)

Francis Harold Laxar, Ph.D. Lehigh University, 1956

The purpose of this work was to determine the effects of static tensile properties, surface hardness, and microstructure on the fatigue resistance of several pressure vessel steels and plain carbon steels when subjected to stresses producing plastic deformation in the specimens.

Fatigue tests were performed on specimens loaded as cantilever beams by a machine of the constant deflection type. A method was devised for determining the maximum cyclic stresses in the plastically-deformed surface of the specimens. Fatigue resistance was measured in terms of (a) maximum cyclic stresses required to produce failure in 5,000 and 100,000 cycles, and (b) strain range to produce failure in 5,000 and 100,000 cycles.

Attempts were made to correlate fatigue resistance with tensile properties, singly and in certain combinations, and with Brinell hardness. A survey of the literature showed a direct relationship between stress causing failure in 100,000 cycles and tensile strength for a variety of materials, both ferrous and non-ferrous. In the present tests a similar relationship was found between strain range for 100,000 cycle lives and tensile strength. The maximum stress for 5,000 and 100,000 cycle lives also correlated closely with the tensile strength. Better correlations were obtained when strain range or maximum stress was plotted against the tensile strength of the surface as determined from its Brinell hardness.

The plastic fatigue resistance of a wide variety of microstructures was studied, and the primary effect of microstructure was found to be due to its effect on tensile strength. When the allowable stresses for 5,000 and 100,000 cycle lives were corrected to a Brinell hardness number of 200, it was found that those microstructures having a low yield-tensile ratio (e.g., ferrite and pearlite) had better fatigue resistance than those having a high yield-tensile ratio (e.g., tempered martensite). However, the prestrained steels, with a yield-tensile ratio of one, were nearly as good as the low yield-tensile steels.

These results appear to be due to the greater amount of plastic deformation which occurred in the low yield-tensile ratio steels during testing and in the prestrained steels before testing. This plastic deformation produced a preferred orientation in the microstructure and a reduction in the severity of microscopic stress-raisers.

The conclusions are: (1) plastic fatigue resistance is directly related to the tensile strength of the surface as determined from its Brinell hardness, and (2) for a given tensile strength the plastic fatigue resistance of microstructures having low yield-tensile ratios is superior to that of microstructures having high yield-tensile ratios, except for the prestrained steels which had plastic fatigue resistance almost equal to that of the low yield-tensile steels.

64 pages. \$2.00. Mic 57-940

THE PHYSICAL FACTORS GOVERNING THE LEACHING OF ORES

(Publication No. 20,058)

Nathan Melvin Levine, Ph.D. Columbia University, 1956

A set of factors which govern the leaching of ores has been defined and organized into a logical system based on the elements of leaching; accessibility, physico-chemical interaction and transport. From this array a set of categories was chosen which permitted a regrouping of factors such as structural, fluid, common to structure and fluid, operational and chemical.

Many of the factors included in these categories had previously been demonstrated by others to be useful parameters of leaching, e.g., particle size, contact time, temperature, solvent type, solvent strength, etc. In this work, a set of structural parameters was selected and demonstrated to be useful leaching parameters for the first time. These include macropore volume, micropore volume, specific surface, pore size distribution and permeability.

The samples of ore used in these studies were from the Top Black member of Chattanooga Shale and originated in

the Sligo Adit near Sparta, Tennessee. Following suitable preparation of samples certain structural parameters of raw and thermally treated shales were measured and comparison made with uranium recovery from leaching samples of these same lots with acid and basic lixiviants. To establish relationships parallelisms were sought between physical measurements and recovery for a given set of chemical conditions and conversely, between chemical variations and recovery for a given set of structural conditions. In this manner the following conclusions were arrived at:

- 1. The causes of limited uranium recovery from the Top Black member of Chattanooga Shale are both physical and chemical.
- 2. a) For a given chemistry, recovery of uranium from raw shale is paralleled by macropore volume, and conversely, for a given macropore volume it is determined by chemistry.
- b) For a given chemistry, recovery of uranium from shale roasted in the temperature range 300°-500°C for a sufficiently long time, is paralleled by macropore volume, and conversely, for a given macropore volume it is determined by chemistry.
- c) For a given chemistry, recovery of uranium from shale roasted above 650°C for a sufficiently long time is paralleled by micropore volume or specific surface and conversely, for a given micropore volume or specific surface it is determined by chemistry.

Since macropore volume and specific surface are factors of exposure and the latter is a sub-element of accessibility, one interpretation based on the parallelisms noted is that for a given chemistry, recovery of uranium from the Top Black member of Chattanooga Shale may be determined by accessibility and conversely, for a given accessibility it is determined by chemistry.

3. Diffusion is not a major factor in limiting recovery of uranium from the Top Black member of Chattanooga Shale by leaching. 127 pages. \$2.00. Mic 57-941

ENTOMOLOGY

THE RESPONSE OF THE EASTERN SUBTERRANEAN TERMITE, RETICULITERMES FLAVIPES (KOLLAR), TO CERTAIN INSECTICIDES

(Publication No. 19,857)

John Vincent Osmun, Ph.D. University of Illinois, 1956

The eastern subterranean termite, Reticulitermes flavipes (Kollar) has long been considered our most destructive structural insect. Although various chemicals, when properly applied, have proven reasonably effective in its control, too little has been known about the specific responses of these insects to insecticides. A relatively simple technique has been developed to study responses under controlled laboratory conditions.

Subterranean termites were reared in gallon-sized plastic containers in each of which was placed 250 ml. of 4.5% bacto-agar, three bundles of previously cut yellow

pine wood, and other required nutrients. Several thousand specimens were maintained per colony. Termites were conveniently removed by opening the bundles of wood.

The basic unit of testing equipment was the 60 mm. petri dish which was used with agar as a holding chamber, and with agar and soil as a contact test chamber. Termites from the worker caste were tested as groups of 10-30 in these dishes with as many replications as needed and held at high humidity in a 24°C cabinet.

Six insecticides were tested: DDT, pentachlorophenol, lindane, chlordane, dieldrin and heptachlor. These materials were tested topically by measured droplets from a microsyringe. The LD/50 for each material, in micrograms per termite, was heptachlor 0.022, dieldrin 0.036, chlordane 0.076, lindane 0.094, and DDT and pentachlorophenol both 0.9.

The same materials were applied in silt loam soil and tested as contact poisons. Exposures of 1, 12, and 24 hours each gave a similar toxicity ranking of materials at

different concentrations of insecticide. In order of decreasing toxicity, they were: heptachlor, dieldrin, lindane, chlordane, pentachlorophenol, and DDT. The latter two were greatly inferior to the others. Similar experiments indicating the speed of toxic action showed lindane to be the most rapid followed in order by pentachlorophenol, heptachlor, chlordane, DDT, and dieldrin.

Repellency was tested by a split-dish technique in which termites had a choice of treated or untreated soil. DDT demonstrated a pronounced repellency at concentrations above 50 p.p.m. due apparently to a delayed contact irritant effect. Pentachlorophenol exhibited a vapor repellency at high concentrations. Lindane, chlordane, dieldrin, and heptachlor were insignificantly repellent.

Vapor toxicity tests were conducted in 140 cc. plastic dishes with the termites isolated $\frac{1}{2}$ inch above the soil. Vapors were released rapidly enough to elicit toxic responses with lindane, heptachlor, chlordane, dieldrin, and pentachlorophenol.

Difference in the retention properties of sandy loam, silt loam, and much soils was tested, the sorbtivity of muck proving to be several times that of the others. The ability of chlordane to translocate in soil was demonstrated.

The subterranean termite proved to be considerably more tolerant of the insecticides tested than are most common test insects. The ability of termites to detoxify lindane at moderate dosages was evident.

136 pages. \$2.00. Mic 57-942

REVIEW OF THE AUCHENORHYNCHOUS HOMOPTERA OF PUERTO RICO. PART III. KINNARIDAE, CERCOPIDAE, MEMBRACIDAE AND CICADIDAE.

(Publication No. 18,003)

José Antonio Ramos, Ph.D. North Carolina State College, 1956

Supervisor: Dr. Z. P. Metcalf

This paper is a systematic study of the Puerto Rican species of the families Kinnaridae, Cercopidae,

Membracidae and Cicadidae of auchenorhynchous Homoptera. The work brings to completion the entire revision of the Auchenorhyncha of Puerto Rico, initiated with a similar study of the Cicadellidae and the Fulgoroidea (except the Kinnaridae) by Caldwell and Martorell (1950a, 1950b) as Parts I and II respectively.

A total of 37 species belonging to these families, of which 22 are described as new, are discussed and illustrated, with notes on their distribution, abundance and host plants. A key to the Puerto Rican families of the Auchenorhyncha and keys to the species of each of the families under consideration are included.

The following species are reported under the Kinnaridae: Oreopenes luteifacies gen. and sp. n., Quilessa collaris sp. n., Q. pellucida Fennah, Q. pellucidoides sp. n., Q. tristis Fennah, Q. atrata sp. n., Q. funebris Fennah, Q. nahiba sp. n., Q. fasciata Fennah, Q. heminfuscata sp. n., Q. oraria sp. n. and Q. wirshingi sp. n. The following are reported under the Cercopidae: Leocomia uprae sp. n., Leocomiopsis scaramuzzai Metcalf and Bruner, Asprocranites variegata gen. and sp. n., Gaetopsis juanalis gen. and sp. n., Clastoptera signifera (Walker), C. flavidorsa Metcalf and Bruner, C. martorelli sp. n. and C. diminuata sp. n. The family Membracidae is represented by the following species: Jibarita borincana gen. and sp. n., Bolbonota melaena (Germar), Nessorhinus gibberulus Stal, N. graciloides Dozier, N. esbeltus sp. n., Spinodarnoides typus Funkhouser, Paradarnoides caldwelli sp. n., Spathenotus tridentatus gen. and sp. n., Brachytalis punctulatus sp. n., Micrutalis calva (Say), Deiroderes inermis gen. and sp. n., Antillotolania doramariae gen. and sp. n., Brachycentrotus rufinervis sp. n., Monobelus fasciatus (Fabricius) and M. maldonadoi sp. n. The Cicadidae are represented by Borencona aguadilla Davis and Proarna hilaris (Germar).

The Puerto Rican fauna of the four families under consideration is discussed and analyzed zoogeographically.

230 pages. \$3.00. Mic 57-943

FINE ARTS

JACQUES BOYCEAU, SIEUR DE LA BARAUDERIE: THE ORIGINS OF THE FRENCH FORMAL GARDEN

(Publication No. 20,120)

Franklin Hamilton Hazlehurst, Ph.D. Princeton University, 1956

The concept of the French formal garden came to full flower under André Le Nôtre, but its seeds are to be found before the period of Louis XIV. This thesis, then, concerns the origins of the French garden of the seventeenth century. The many components comprising this type of garden are admirably summed up by the theorist and practitioner of landscape design, Jacques Boyceau de la Barauderie, who lived in the periods of Henry IV and Louis XIII. Hence, the major part of the dissertation will be devoted to the accomplishments of this artist.

It is essential in understanding the beginnings of French garden design to survey landscape theory and practice prior to the work of Boyceau, for the impress of Italy was important in the slow development of French garden theory of the late fifteenth and sixteenth centuries. Therefore,

the impetus given to gardening in France by such men as Pietro de' Crescenzi in his treatise, Opus ruralium commodorum, and the garden practice in France of the Italians, Pacello da Mercogliano and Gerolamo da Napoli, and later Sebastiano Serlio, is considered in evaluating the sources of the French garden.

Another vital source of Italian influence comes to France in the sixteenth century with the Hypnerotomachia Poliphili. The ideas derived from this book enlivened the stereotyped gardens of France with features which were highly bizarre in character. Especially taken with these fanciful devices was the great ceramist and grotto builder, Bernard Palissy, who, in his Recepte véritable, lays down, for the first time in France, rules for the ideal garden, constructed wholly for pleasure.

French garden treatises appear only from the second half of the sixteenth century with such books as Praedium rusticum by Charles Estienne and Théâtre d'Agriculture by Olivier de Serres. But in these studies there is no positive interest in the pleasure garden but rather only various agricultural formulas. The last real manifestation in France of Italian influence on landscape composition occurs in the period of Henry IV and Marie de Médicis. At this time, it is not so much general rules that are borrowed but specific Italian monuments which are taken as a point of departure.

Out of this welter of material arises Jacques Boyceau who in his works both sums up the past history of French gardening and landscape design and already speaks fluently the language of fully developed seventeenth century garden theory and practice. In addition to his Traité du jardinage, selon les raisons de la nature et de l'Art which, for the first time in France, approached garden design from an aesthetic point of view, Boyceau created some of the greatest gardens of his period. Aside from his work at already extant gardens such as those of Fontainebleau, the Tuileries, and Saint-Germain-en-Laye, this theorist-practitioner probably designed the gardens of the first Versailles and the more significant gardens of the Luxembourg.

Boyceau's contribution to the art of gardening cannot be underestimated, for he presents a nouveauté in approach which foreshadowed the later works of André Le Nôtre. He is also important as the reflection of the versatile, intelligent man of the transitional periods of Henry IV and Louis XIII. In this artist is concentrated much of the history and mores of the time; he is at once the Protestant man of action, the philosopher, the poet, the botanist, the scientist, the many-sided artist, as much at home on the battlefield as in the garden. Without his contribution to French garden composition, the work of André Le Nôtre, if not impossible, surely would not have shown so brightly.

386 pages. \$4.95. Mic 57-944

WILLIAM PAGE: "THE AMERICAN TITIAN"

(Publication No. 20,162)

Joshua C. Taylor, Ph.D. Princeton University, 1956

The name of the American painter, William Page (1811-1885), appears often in critical controversies on art

in America in the mid-nineteenth century. Probably no other painter received such ecstatic praise, praise which accorded him place next to, if not above, that of Titian. Yet at the same time he was considered by some as painting little more than brutally exact representations of his subjects. His work formed a focus for discussion of the Real and the Ideal: just how these seemingly opposing concepts might be embodied in American art. But it has been impossible to understand the exact basis of these discussions because Page's works and ideas, highly significant to such thoughtful contemporaries as James Russell Lowell and Mr. and Mrs. Browning, had already become obscure by the end of his life.

It is the purpose of this study, using a large body of unpublished correspondence, lecture manuscripts, drawings and paintings, largely still in the hands of Page's descendants, to reconstruct Page's career, his ideas on art, and the aspects of his personality which so strongly attracted his associates; and, on the other hand, to reassemble a sufficient body of his painting to make possible once again a just notion of his characteristics as a painter. A catalogue listing some 250 drawings and paintings is included. In the process of the study, a new light is thrown on the development of taste in the United States, not only in art but in literature and criticism.

Page, one of the first students of the National Academy of Design, achieved his first success as a painter in 1835, and from that time enjoyed an enviable success as a portraitist capable of the rich color of Titian. In 1840 a three-way friendship between James Russell Lowell, Charles F. Briggs and Page was formed. As a result Page was prompted to systematize his many ideas on art which were eagerly seized upon by the younger Transcendentalists in Boston where Page worked during the 1840's. These theories, which had immediate meaning for his painting, show him struggling with the problem of adjusting a concept of ideality in art to a deep felt necessity to be scrupulously true to the appearance of nature. Titian was his guide, and the ideas of Emerson and Hazlitt were used to oppose the dicta of Reynolds. The result was a curiously "functional" theory, in some respects employing in painting the theories applied to architecture by Horatio Greenough.

In Italy, chiefly in Rome, from 1850 to 1860, Page developed further his theories of art including now a mystical theory of human proportion, and refined his imitations of Titian. Through Hiram Powers he discovered the writings of Swedenborg and, significantly, translated his art theories into Swedenborgian terms. It was in Italy that the Brownings, of whom unpublished correspondence is included, became fascinated with Page.

After his return to the United States in 1860, Page never succeeded in regaining his former popular success as a painter. The often stated reason for this that his theories had overcome his artistic judgment is carefully considered. His time was spent on paintings meant to embody his now largely Swedenborgian ideas: paintings of Venus, a portrait of Christ at the moment of the Transfiguration, and a "true" portrait of Shakespeare.

In 1871 Page was elected as a reforming president of the National Academy of Design, but illness forced him to withdraw from all artistic activity by 1877.

The study shows Page as serving his sympathetic contemporaries as a symbol of the creative individual artist fusing by his "genius" the tradition of the past, with the complex modern perception of nature. His role as "symbol" seems to have been more important actually than his individual paintings. A final chapter brings together for

the first time the theories which marked Page as a significant individual to many of his time.

460 pages. \$5.85. Mic 57-945

FOOD TECHNOLOGY

EFFECTS OF CHLORTETRACYCLINE AND OXYTETRACYCLINE HYDROCHLORIDES ON THE CARCASS CHARACTERISTICS OF MARKET PIGS

(Publication No. 20,363)

Ralph Pollister Soule, Jr., Ph.D. Kansas State College, 1957

Antibiotics have been incorporated in swine rations for several years. Experimental workers have reported that the increased rate of gain is due to an increase in fat deposition. This project was designed to determine the manner of fat deposition, antibiotic content of the tissue, carcass and slaughter data, frozen storage potential acceptability, and chemical analyses. Four replicas were conducted over a three year period using 52 weanling pigs. Littermate pigs of the same sex within each replica from sows which received a non-antibiotic supplemented ration were self-fed ad libitum individually on concrete floored pens. The pigs were allotted at random into three groups: Group I, basal ration; Group II, basal plus 10 mg aureomycin HCl per pound of total ration; Group III, basal plus 10 mg terramycin HCl per pound of total ration. The pigs were slaughtered at 225 pounds. Length of carcass, back fat thickness, leg length, ham length, depth of body, flank pocket thickness, and circumference of ham and hock were determined. The pH value was recorded for the stomach, duodenal, large intestine, small intestine, and caecal ingesta, liver, and M. Psoas major. Cut out data and the area of the cross section of the loin and ham were recorded. Physical separation of the 9th through the 13th rib was made. The M. Longissimus dorsi was analyzed for press fluid, total nitrogen, non-protein, fat, and moisture. Fatty tissue was analyzed for peroxide oxygen, acid number, iodine number, and refractive index. Chemical analyses were made on frozen stored roasts.

Pigs fed aureomycin had the highest daily rate of gain, feed efficiency, and a slightly higher dressing percentage. The controls had the heaviest kidneys and adrenals while aureomycin pigs had lightest adrenals and terramycin pigs

the heaviest thyroids. The controls had the lowest pH for the pyloric ingesta, but there were no other variations in pH values.

Leg and ham length was longest in the terramycin pigs and carcass length was significantly longer than the aureomycin pigs and slightly longer than the controls. The circumference of ham and ham plumpness index were largest in the controls.

Aureomycin pigs had a significantly thicker average back fat than the control or terramycin pigs (P < .01). The controls had significantly thicker average back fat than the terramycin pigs (P < .01). The aureomycin pigs had the thickest flank pocket and heaviest bellies. The aureomycin pigs had the lowest percentage of lean cuts. The aureomycin pigs had significantly heavier back fat than either the control (P < .05) or terramycin pigs (P < .01).

The loin-eye area percentage was least in the aureomycin pigs while the fat area was largest. The physical separation of the 9-13 rib cut showed that the aureomycin pigs were significantly fatter (P < .01). The terramycin pigs had a significantly larger percentage of physical separable lean than the aureomycin and slightly higher than the controls. There were no differences for the bone measurements. The aureomycin pigs had the most efficient feed utilization for the feed consumed per 100 pounds of chilled carcass.

The antibiotics tested had no significant effect on cooking losses and palatability scores of fresh or frozen loin roasts. The average data showed no great differences in the chemical analysis of the fat, muscle, liver, or fresh or frozen roasts. There were no differences in the antibiotic content in the tissue and ingesta. The terramycin pigs produced the highest grading carcasses when based on the Official Standards for Pork Carcasses.

It can be concluded that the two antibiotics did not reveal outstanding differences except the aureomycin pigs which produced significantly fatter carcasses, had the largest daily rate of gain, and utilized the feed most efficiently.

253 pages. \$3.30. Mic 57-946

GEOGRAPHY

HISTORICAL GEOGRAPHY OF THE NORTH CAROLINA OUTER BANKS

(Publication No. 18,731)

Gary Seamans Dunbar, Ph.D. Louisiana State University, 1956

Supervisor: Professor Fred B. Kniffen

The term Outer Banks refers to the barrier chain between Cape Lookout and the Virginia state line. Early known as a result of the Raleigh Roanoke ventures, the Banks received their first permanent settlers in the late 17th and early 18th centuries when stock raisers from Virginia and the Albemarle were seeking marsh and island locations for their stock. The difficult inlets early necessitated resident pilots. The early settlers on the Banks were not shipwrecked sailors, as is popularly believed, but were herders and pilots who derived imediately from the Chesapeake and Albemarle areas.

A barrier to navigation, the Banks proved to be also a bulwark of defense, a difficult coast to which to lay siege. Since the early commerce of northeastern North Carolina was in great part maritime and used the inlets, the Banks were personally involved in all wars up to and including the Civil War.

As use of the Banks for stock raising declined, commercial fishing became the leading occupation. Government service became an important means of livelihood after the Life Saving (later Coast Guard) Stations were established beginning in the late 1870's but has lately declined as most of the Coast Guard stations have been decommissioned. Although the 1950 census shows that fishing is still the principal single occupation on the Banks, the Bankers are turning increasingly to various aspects of the tourist business.

300 pages. \$3.85. Mic 57-947

SETTLEMENT SUCCESSION IN EASTERN FRENCH LOUISIANA

(Publication No. 18,737)

William Bernard Knipmeyer, Ph.D. Louisiana State University, 1956

Supervisor: Professor Fred B. Kniffen

Culture is the means by which the accomplishments of a people are transmitted from generation to generation. In addition to non-material things such as language, religion, and customs, the conservative force of culture also affects the material products such as dwellings and other structures and thus manifests itself in a landscape which bears the mark of a particular people. Much has been done in the study of the non-material culture of the Louisiana French people, but little for the material aspects of that

culture group. No effort has been made to collect and systematize those terms of material culture which distinguish that part Louisiana inhabited by the descendants of French colonists. Those items are the subject of this investigation.

Extensive field studies revealed a large number of landscape forms which are identifiable as products of the Louisiana French culture group. They include dwellings, outbuildings, boats, fences, and systems of field and lot enclosure, and settlement pattern. Detailed information on these and associated traits was obtained by field observation and interrogation of many informants in a number of selected representative settlements. Investigation was limited to the eastern division of French Louisiana, the region of bayou settlements, where the controlling factors and changes in the settlement succession have been uniform.

Each landscape form where possible was traced from its development through modifications to abandonment or incorporation into the present landscape. Some forms were found to be general, others to be associated with the different landscape types of the region: the trapper-fisherswamper landscape, the farm or plantation landscapes. Each trait or kind of landscape fits a broader picture of landscape evolution which was controlled by the factors of mechanization, invention, and cultural diffusion. Significant changes in landscape aspects occurred at four critical times: the change from aboriginal to European frontier, frontier to pioneer, pioneer to recent, and recent to modern. The sequence of change in all landscape forms comprises the settlement succession for the region. The present landscape pattern of the region is composed of elements of different kinds of landscapes in different stages of the succession. 336 pages. \$4.30. Mic 57-948

PRESENT ECONOMY AND POTENTIAL DEVELOPMENT OF THE BALUCHISTAN STATES OF PAKISTAN

(Publication No. 19,889)

Charles Corbin Yahr, Ph.D. University of Illinois, 1956

The Baluchistan States of Pakistan (Kalat, Las Bela, Makran, and Kharan), although little known to Americans, are important to the United States and the western world because of their strategic location and because of the numerous development plans, many with western sponsorship. And they are of even more importance to Pakistan, of course, with long land and sea borders to defend, and large area and low population density--551,978 persons on 79,546 square miles. In consideration of these factors, with the opportunity afforded the author by two years' residence in Pakistan as an employee of Silver Burdett Company of New York, the Baluchistan States are studied with regard to the physical characteristics, the historical and

political development, the characteristics of the people and settlements, the economies presently practiced, and the projects for increasing the resource base and improving the living conditions.

The Baluchistan States are faced with many deterrents to development. Among these are the physical handicaps of an arid climate, rugged topography, limited mineral, forest, and soil resources, and isolation from centers of activity and production, the human handicaps of a people intelligent but illiterate, steeped in tradition, and circumscribed by the tribal way of life, and, in the past, a government often less interested in the welfare of the many than in the welfare of the few.

The people, chiefly Brahui and Balochi tribal Muslims, live in agricultural villages and towns, of which Ghulam Bolak, Kosh Kalat, Kalat, and Mastung are studied in detail. Many Brahuis are nomadic or seminomadic, shifting with their flocks between the highlands in summer and the lowlands in winter. Agriculture and grazing are the dominant occupations, accounting for four-fifths of the labor force. Fishing and mining are restricted to the Baluchistan coast and to the Deghari coal field of Kalat State, respectively. Manufacturing, construction, trade, transportation, and personal and public services have barely enough workers and productivity to provide minimum goods and services to the farmers and herders. The economy is seriously hampered by barter transactions and by poor transportation facilities and high transportation

costs which prevent the products of the Baluchistan States from competing successfully in the markets of the nation.

Agriculture is characterized by small, family-owned and -operated farms, on which, using simple hand tools, human power, and some animal power, the cultivators grow a wide variety of crops. Chief of these are wheat, jowar, rice, oil seeds, pulses, fodder, vegetables, dates, and other fruits. In only about 10 percent of the total area are there level land, fertile soil, and water in proper association for successful agriculture, and only a fraction of this is cultivated in any one year. All levels of government in Pakistan and various international agencies are attempting to increase agricultural production, chiefly by increasing the water supply. Most of the projects have been undertaken so recently that there are as yet few or no tangible results.

The formation of the Baluchistan States Union in 1952 was a major step toward popular, responsible government. It has already given promise of assuming leadership in bringing political, social, and economic progress. However, as of June, 1954, the Baluchistan States were still underdeveloped. The development projects must show results before excess population from elsewhere in Pakistan can be supported in Baluchistan or before the present population can reach living standards comparable to those in much of Pakistan. Thus the immediate objectives of resource development in the Baluchistan States must be to improve the living standards of the present population and to make the area a more nearly self-supporting unit of the Pakistan nation.

280 pages. \$3.60. Mic 57-949

GEOLOGY

GEOLOGY OF THE EDISON AREA, SUSSEX COUNTY, NEW JERSEY (PARTS I-III)

(Publication No. 20,100)

Donald Roy Baker, Ph.D. Princeton University, 1955

The Edison area is in the New Jersey Highlands three miles south of Franklin, New Jersey and is a part of a structural block, which trends northeast and is bounded by high-angle faults on the northwest and southeast. An older complex of sedimentary rocks (Grenville type), modified by regional metamorphism and metasomatism and intruded by younger igneous rocks, underlies the region. Lithologic units define a major anticline which plunges 30° northeast and is overturned to the northwest. Foliation and lineation are structures within lithologic units. In the Edison area magnetite ore zones are tabular-shaped bodies which pinch-out in the foliation plane in a direction parallel to the lineation.

The Edison gneiss, a major lithologic unit in the Edison area, is divided into four subunits. The mixed gneiss subunit is a complex of interlayered gneisses, pegmatite and magnetite zones. Quartz, K-feldspar and magnetite are major minerals; minor minerals include biotite, sillimanite, garnet, ilmenohematite, apatite, monasite, zircon, hemoilmenite, ilmenite, rutile, martite and sulfides.

Magnetite-quartz-K-feldspar gneiss is predominant but layers with metasedimentary affinity are abundant. The biotite-quartz-feldspar gneiss subunit is composed of oligoclase, K-feldspar, biotite and garnet with hornblende, ilmenomagnetite, ilmenite, and apatite. Epidote-scapolite-quartz gneiss (lime-rich subunit) with layers varying from metaquartsite to quartz-feldspar gneiss is composed of quartz, oligoclase, microcline, epidote, scapolite, actinolite, salite, phlogopite; and sphene, calcite, magnetite, martite, ilmenohematite, and garnet. The quartz-K-feldspar gneiss is a uniform subunit composed of perthitic K-feldspar, garnet, ilmenomagnetite, biotite and zircon. Wall rocks to these subunits are of igneous origin and include pyroxene syenite gneiss, hornblende granite and pyroxene granite.

X-ray observations prove that K-feldspar from magnetite-rich layers is monoclinic, but K-feldspar from magnetite-quartz-K-feldspar gneiss is microcline with 0.9 triclinicity. K-feldspar from biotite-quartz-feldspar gneiss and quartz-K-feldspar gneiss is a mixture of triclinic and monoclinic polymorphs.

The primary iron-titanium oxide paragenesis in the Edison unit includes ilmenomagnetite, ilmenite, hematite, hemoilmenite, ilmenohematite, rutile-ilmenohematite, rutilohematite, hemorutile and rutile. Magnetite is altered to martite. The other intergrowths are exsolution products. A tentative subsolidus temperature-composition diagram for the hematite-ilmenite-rutile system is presented.

The chemical composition of magnetite-quartz-K-feldspar gneiss is similar to sillimanite-quartz-microcline granite gneiss of the Adirondacks which is a metasomatized metasediment. In the mixed gneiss subunit, Ba and Mn are enriched in magnetite layers; TiO₂ varies from 0.2 to 2.0 wt. % and occurs in a constant proportion to iron; sulfur (0.01 to 0.5 wt. %) is from sulfides which crystallized later than magnetite; phosphorus (0.1 - 0.8 wt. %) and iron (up to 60 wt. %) are in a constant ratio which is believed to be a reflection of the composition of a parent ore fluid. Primary hematite is enriched over magnetite in rocks of metasedimentary type and the magnetite/hematite ratio (oxidation degree) decreases linearly with increase in total iron.

Now thermodynamic calculations enabled the construction of univariant isobars for the magnetite-hematite reaction $(2Fe_3O_4 + \frac{1}{2}O_2 = 3Fe_2O_3)$ and water reaction $(2H_2 + O_2 = 2H_2O)$ for temperatures from $25^\circ - 1300^\circ C$ and pressures from 1 - 7000 atms. Assuming magnetite and hematite formed at equilibrium at a given temperature and pressure, the equilibrium $p(O_2)$ and $p(H_2)$ for the petrologic system are obtained directly from the univariant curves. The univariant curves indicate that in cooling from a magnetite-hematite equilibrium there is a continual production of "excess" O_2 (due to H_2O dissociation) so that magnetite is continually oxidized to hematite; hence, martite is considered a retrograde mineral.

It is concluded that the mixed gneiss subunit represents argillaceous and arenaceous sedimentary rocks which have been recrystallized to gneisses of amphibolite grade by regional metamorphism and reconstituted by Feand-K-metasomatism. Similarly, the lime-rich subunit originated by the regional metamorphism and K-metasomatism of calcareous sedimentary rocks. The biotite-quartz-feldspar gneiss is a facsimile of gneisses in the Adirondacks which are regional metamorphosed (amphibolite grade) and K-metasomatized graywacke. The quartz-K-feldspar gneiss crystallized directly from the K-rich fluids which chemically reconstituted the other gneisses.

The magnetite deposits in the mixed gneiss subunit formed during regional metamorphism and metasomatism. The initial source of the iron was from residual fluids developed from the progressive crystallization of granitic magma. Some of the ferric iron may be of sedimentary (exogene) origin. The iron-rich fluids permeated and metasomatically replaced the co-existing rock material.

323 pages. \$4.15. Mic 57-950

STRUCTURAL AND PETROLOGICAL STUDIES IN HAMILTON COUNTY, NEW YORK

(Publication No. 20,102)

Paul M. Bartholome, Ph.D. Princeton University, 1956

Hamilton County is situated in the south-central Adirondacks of New York state. It is an area of Precambrian gneisses among which members of the charnockite suite are abundant. A large anorthosite body folded into several domes forms the substratum. It is overlain by a thick sheet of syenite gneiss and a metasedimentary sequence intruded by thinner sheets of syenite gneiss and

gabbroic anorthosite gneiss. The latter may show gravity differentiated layers rich in magnetite and ilmenite. Many basic dikes, sheets and stocks have been found; they belong to at least three periods of intrusion, the last of which is post-kinematic. The granite gneisses and migmatites are thought to be of metasedimentary origin for the most part. The only unquestionable metasediments are quartzite and marble. Quartz-hypersthene-plagioclase gneisses and garnet leptynites are described.

The mechanical and mineralogical transformations brought about by the dynamothermal metamorphism have been studied with special emphasis given to the basic intrusives: anorthosite, gabbroic anorthosite and olivine gabbro. Each one of these gives rise to a number of metamorphic derivatives characterized by different degrees of deformation and recrystallization. The least deformed rocks have an ophitic texture and contain abundant relics of the magmatic mineralogy. Garnet and hornblende form coronas around mafic minerals. The most deformed rocks are totally recrystallized and often contain garnet porphyroblasts. The appearance of the secondary mineralogy (pyroxenes free from exsolutions, garnet, hornblende, secondary plagioclase, pure ilmenite and magnetite) at the expense of the magmatic mineralogy (olivine, pyroxenes with exsolution lamellae, clouded plagioclase, hemo-ilmenite) is closely related to the development of the gneissic structures. It is concluded that (1) plastic flow is of paramount importance in bringing about chemical metamorphic reactions to completion, (2) the garnet ores, and in general the rocks carrying garnet porphyroblasts, result from particularly intense dynamothermal metamorphism.

The plastic flow responsible for the development of the gneissic structures has been studied in two particular instances. It is shown that in addition to the component normal to the regional fold axes, the flow may have a component parallel to them and therefore may be three-dimensional. When this component is the most important, the gneiss has no foliation but displays a lineation subparallel to the direction of transport. Where it is nil, i.e. where the flow is two-dimensional, the gneiss displays a foliation but no lineation. In all other cases foliation and lineation exist; the latter is oblique to the direction of transport. A classification of the gneissic structures is proposed.

The growth of the garnet porphyroblasts of Barton mine is studied in detail and an attempt is made to explain the particular structure of the rock.

211 pages. \$2.75. Mic 57-951

AN INTERPRETATION OF THE GEOLOGIC HISTORY OF PART OF THE TIMISKAMING SUBPROVINCE, CANADA

(Publication No. 20, 103)

Manuel Nathan Bass, Ph.D. Princeton University, 1956

The part of the Timiskaming subprovince covered herein contains the most carefully studied and extensive tract of Archean-type volcanics and sedimentary rocks of the Canadian Shield.

The sedimentary rocks, including arkose, reflect an

GEOLOGY 599

environment of rapid erosion and tectonic conditions yielding poorly sorted (wacke) deposits. Volcanics are predominantly andesite, basalt and related intrusives. Wide range of chemical composition among basalts indicates a tendency to differentiate, the products including, apparently, most ultramafics of the region.

Acid to intermediate intrusives are dominantly sodic. Parallel with a variation in size from dikes and sills to batholiths is a continuous variation from highly to little altered, highly sodic to equally sodic and potassic, and from non-pegmatitic to highly pegmatitic. Larger, more potassic bodies comprise mainly the southern granite complex lying south of, and the La Motte-La Corne batholith lying within, the main sediment-volcanic complex. Smaller, relatively more sodic masses lie almost entirely within the sediment-volcanic complex, and small, highly sodic bodies concentrate in and near major shear zones.

Mappable units on all scales are lenticular so that marker horizons are of use only locally. Tabular rock units are almost universally folded to steep or vertical positions. Shear zones are common and widespread. Smaller ones may be due to many causes, but most large and many small ones are undoubtedly faults. Most common are strike faults, three major ones being the Larder Lake-Bouzan Lake-Cadillac, Porcupine-Destor and Manneville faults. Marker horizons for measuring offset along strike faults are absent, but along the three major strike faults, with exception of one area in western Quebec, the south side has apparently moved relatively upward. These three faults are interpreted as major thrusts related to orogeny along an axis within the southern granite complex. Major faults are often conformable with structure on one side (generally the south), while they cross-cut structure on the other side.

Review of evidence for unconformities shows that most are poorly substantiated. Those that exist suggest conditions favorable to easy creation or destruction of unconformities of local extent and minor time significance.

Mounting evidence within the last 50 years has shown that classical stratigraphy of the Shield, though still holding considerably sway, is not borne out by field facts. The term Laurentian has fallen into almost total disuse. Interstratification of volcanics and sedimentary rocks on all scales and their equal degrees of folding along parallel axes seriously challenge the concept of a Keewatin period of volcanism separated by major orogeny from a Timiskaming period of sedimentation. Keewatin, Timiskaming, Haileyburian and Algoman, in effect, refer to lithologicstructural groups rather than stratigraphic units. The main basis for Laurentian granite and a major Keewatin-Timiskaming unconformity is socalled "granite" pebbles in Timiskaming conglomerates. Petrographic study of pebbles shows they are not "granite" in the sense formerly supposed, but probably fragments of minor intrusives, mainly porphyries, which originated contemporaneously with and after Keewatin-type volcanism.

Field and laboratory observations of Archean-type geology of the Timiskaming subprovince are in accord with an island arc hypothesis which places the axis of a former tectogene within the southern granite complex and the axis of a former geanticline within the sediment-volcanic complex to the north. Various criteria permit locating at least one, perhaps several volcanic centers. The hypothesis suggests that the large ultramafic area in the La Motte area may be part of the mantle.

The island arc hypothesis and empirical facts of basaltic rocks allow construction of a petrogenetic scheme which accounts for basalt as a partial-melting product of the peridotite mantle; small (normative-quartz-free) diorite, monzonite and syenite bodies and their extrusive equivalents of the geanticline as dry-melting products of basalt; small normative-quartz-bearing acid to intermediate intrusive and extrusive bodies of the geanticline as wetmelting products of basalt; the southern granite complex as the granitized (broad sense) product of igneous and sedimentary rocks carried into the tectogene; and the La Motte-La Corne mass as part of the granitized tectogene root which spread laterally.

362 pages. \$4.65. Mic 57-952

SUBSURFACE GEOLOGY IN THE AREA OF THE CAPE FEAR ARCH AS DETERMINED BY SEISMIC-REFRACTION MEASUREMENTS

(Publication No. 20,225)

William Emory Bonini, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor George Prior Woollard

The report of rocks of Triassic age beneath a normal sequence of Coastal Plain sediments at Florence, S. C., a shallow depth to the crystalline basement rock surface at Cape Fear, N. C., and the seismic nature of the Charleston, S. C., area, all suggest that the basement rock geology of the Atlantic Coastal Plain south of Norfolk is complex.

To augment the limited well data in the area, so that a better knowledge of the geology could be secured for analytical study, sixty seismic-refraction measurements were made along traverses across the Coastal Plain in South Carolina and North Carolina. Four traverses were made perpendicular to the Fall Line, and one parallel to it and midway between the Fall Line and the coast.

To aid in the correlation of seismic velocity values with basement lithology, forty seismic velocity measurements were made on representative rock types in the adjacent Piedmont area. Observed velocity variations for different rock types were as follows: Cretaceous and Tertiary sediments, 6000-9600 ft./sec.; Triassic sediments, 10,500-14,900 ft./sec.; Triassic diabase, 21,800 ft./sec.; granite, gneiss, schist, Carolina slate belt, 15,900-19,000 ft./sec.; basic rocks, up to 24,000 ft./sec. Comparative velocity values for the same rock types beneath the Coastal Plain, as identified from well data, indicate that the Piedmont velocity values are 5% lower than obtained for the same rock units of the Coastal Plain floor. This is attributed to a greater depth of weathering of the Piedmont rocks.

On the basis of basement velocities, depth determinations and well data, the following observations can be made: (1) Lithologic and structural trends within the surface of the pre-Cretaceous basement are sub-parallel to those in the Piedmont. (2) The observed lithologic complex of the Piedmont extends beneath the Coastal Plain to the present coast of South Carolina and possibly eastward. (3) The Carolina slate belt extends as far southeast as Fayetteville, N. C., where it is 80 miles in width and includes the Triassic Deep River Basin. (4) A narrow,

600 GEOLOGY

eastern slate belt is postulated to run from Allendale Co., S. C., to Bladen Co., N. C. (5) The Triassic Florence Basin extends from Florence to St. Charles, S. C., with a maximum width of 13 miles. (6) From near Raeford, N. C., into Johnston Co., N. C., a new Triassic basin is postulated on the basis of a low velocity zone having Triassic velocity values. (7) The Cape Fear Arch is a broad, gentle upwarp of the basement whose relief diminishes gradually toward the Fall Line. The axis of the Arch is approximately perpendicular to Appalachian and Piedmont structural trends. (8) There is no break in basement slope northwest of Conway, S. C., as postulated by MacCarthy, Prouty and Alexander (1933). The matnetic gradient change is related to the presence of basic rock in the basement as indicated by the high velocity values. (9) The topographic relief of the basement surface is of the order

There is a similarity of pattern between the presently active mobile belt of the Pacific island arcs, which have an arcuate arrangement with perpendicular structures (Carolina Swell, etc.), and the older mobile belt of the Appalachians, which have arcuate structures (Pennsylvania and Tennessee salients) and perpendicular Coastal Plain structures (Penninsular Arch, Beaufort Basin, Cape Fear Arch, etc.). On the basis of this similarity plus the stratigraphic evidence indicating movements in Cretaceous and Tertiary, the hypothesis is advanced that the Cape Fear Arch is the result of recurrent movements on an older structure related in origin to Paleozoic tectonic forces responsible for the arcuate Appalachian structures. Cretaceous and Tertiary movements resulling in sedimentary structures in the Coastal Plain sediments are believed to have been the result of differential down-tilting of the Coastal Plain caused by differential isostatic adjustments in the Appalachians. 218 pages. \$2.85. Mic 57-953

SEDIMENTARY HISTORY OF THE OGADEN DISTRICT, ETHIOPIA

(Publication No. 20,052)

William Orrin Clift, Ph.D. Columbia University, 1956

The Sinclair Petroleum Company has conducted an intensive exploration program in a remote area of Ethiopia for the past eight years. Progress has been both slow and costly owing to absence of roads and distance from sources of supply. Cavernous formational characteristics coupled with insufficient water resources have been an additional hindrance.

Subsurface exploration has been concentrated in a Mesozoic and Cenozoic embayment of marine, continental, and evaporitic formations. The well-preserved sedimentary sequence has permitted correlation of events which are not as readily discernible in the surface sections to the north, west, and southwest. The basal Triassic sand and the Cretaceous-Paleocene Nubian sand are interpreted as transgressive and regressive facies of a shelf sea which reached its maximum extent in Upper Jurassic (Portlandian). This cycle was interrupted by minor oscillations, and one major hiatus is represented. The name "Gumburo" is assigned to a series of

undifferentiated Cretaceous limestones and shales which are age equivalents of three formations in the western Ogaden reflecting near-shore changes in depositional environment. 43 pages. \$2.00. Mic 57-954

STUDIES ON THE OSTRACODA FROM JAPAN:
I SUBFAMILIES LEPTOCYTHERINAE, N. SUBFAM.,
"TOULMINIINAE", N. SUBFAM.,
AND CYTHERURINAE G. W. MULLER

(Publication No. 17,443)

Tetsuro Hanai, Ph.D. Louisiana State University, 1956

Supervisor: Professor Henry V. Howe

This paper is part of a basic taxonomic study of Ostracoda found living in the sea surrounding Japan and as fossils in Pliocene and Miocene deposits in Japan. In this paper the subfamilies Leptocytherinae, n. subfam., "Toulminiinae," n. subfam. and Cytherurinae G. W. Muller are described. As a result of this study, it was found that Leptocytherinae have graditionally variable dentitition, but can be classified into four genera: (Leptocythere G. O. Sars, Callistocythere Ruggieri, Tanella Kingma, and Microcallistocythere, n. gen.) on the basis of the hinge structure. The Japanese samples studied contained 11 species of Callistocythere, one species of Tanella, and one species of Microcallistocythere. "Toulminiinae" include three genera, "Toulminia" Munsey, Neocythere, n. gen., and Arcacythere Hornibrook. The Japanese samples contained two species of "Toulminia" and two species of Neocythere. Cytherurinae can be classified into the following groups and subgroups on the basis of hinge structure: 1) Cytherura group (Cytherura G. O. Sars, Hemicytherura Elofson, Tetracytherura Ruggieri, Microcytherura G. W. Muller, and Howeina, n. gen.), 2) Cytheropteron group, 2a) Cytheropteron subgroup (Cytheropteron G. O. Sars, Aversovalva Hornibrook, Kangarina Coryell and Fields, and Kobayashiella, n. gen.), 2b) Paracytheridea subgroup (Paracytheridea G. W. Muller, Paracytheropteron Ruggieri, and Pseudocytherura Duboysky), 3) Eocytheropteron group (Eocytheropteron Alexander, and Budaia Mehes), and 4) uncertain genera (Looneyella Peck, Orthonotacythere Alexander, Eucytherura G. W. Muller, and Paradoxorhyncha Chapman). The Japanese samples contained six species of Cytherura, one species of Howeina, three species of Hemicytherura, four species of Cytheropteron, and one species of Kobayashiella. Of the 34 species and subspecies described and illustrated in this paper, 31 are new. 142 pages. \$2.00. Mic 57-955

TITANIUM MINERALOGY OF SOME BAUXITES

(Publication No. 20,240)

James Austin Hartman, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor E. N. Cameron

The objectives of this study are sixfold:

- 1. The titanium mineralogy of +325 fraction of heavy minerals obtained from bauxite samples.
- 2. The stages of alteration of primary titanium minerals to secondary titanium oxides.
- 3. Effect of parent material on the alteration sequence and the end products.
- 4. The distribution of titanium minerals in various size ranges.
 - 5. The mineralogical composition of leucoxene.
- 6. The factors which control the formation of the TiO₂ polymorphs.

Samples examined are from Arkansas, France, Jamaica, Oregon, Ireland and Surinam.

The heavy minerals were studied in polished surface and modal analyses made. Selected grains were studied by X-ray diffraction methods. X-ray fluorescence techniques were applied to a sample of anatase and a sample of ilmenite to ascertain the impurities in each.

The following conclusions can be drawn:

- 1. Ilmenite is the parent mineral for the secondary titanium oxides of +325 grain size in the bauxites. Titanium in silicates in the parent rock is responsible for most of the titanium which is found in the -325 mesh material.
- 2. Titanium minerals in the bauxites and clays are rutile, anatase, leucoxene, ilmenite, titaniferous magnetite, menaccanite and titaniferous hematite. Almost any combination of the first four named minerals can be found.
- 3. Alteration of ilmenite in bauxites is more complex than in beach sands. Four types of alteration occur:
 1) alteration to leucoxene A; 2) alteration to leucoxene B;
 3) alteration to anatase; and 4) alteration to a patchy type similar to stage 1 of the beach sands. Types 1 and 2 are found in all deposits; types 3 and 4 occur only in Arkansas.
- 4. The initial alteration product of ilmenite is anatase. With age anatase transforms to rutile.
- 5. The parent rock does not exert any influence in determining which ${\rm TiO_2}$ polymorph will form from the alteration of ilmenite. Parent rock has some effect on the size of the titanium minerals in bauxites. Ores derived from syenites and non-calcareous sediments show a maximum in the -40 +100 or -200 fractions; bauxites derived from limestones and basalts show a maximum only in the -200 fraction.
- 6. Leucoxene in the bauxites consists of rutile and anatase. Arizonite was not detected.
- 7. The bulk of the TiO_2 in bauxites occurs in the -325 fraction.
- 8. Important factors which control the formation of TiO₂ polymorphs under surface conditions are rate of alteration, pH and especially impurities.
- 9. In Arkansas niobium (columbium) is concentrated in the secondary titanium oxides.
- 10. Red muds from Arkansas contain sufficient TiO₂ in the +325 fraction to warrant investigation into methods of recovering it. 104 pages. \$2.00. Mic 57-956

A STUDY OF THE METAMORPHISM OF THE UPPER HURONIAN ROCKS OF THE WESTERN PORTION OF THE MARQUETTE DISTRICT, NORTHERN PENINSULA, MICHIGAN

(Publication No. 19,202)

Eiler Leonard Henrickson, Ph.D. University of Minnesota, 1956

Upper Huronian rocks underlie an area consisting of about 2200 square miles of the approximately 7000 square miles of Precambrian rock exposure of the northern peninsula of Michigan, in other words, approximately onethird of the total Precambrian in this region. Toward the east, commencing at about the center of the peninsula, the Precambrian rocks disappear beneath the Paleozoic cover, and little is known about these underlying rocks. Toward the north and west, the Upper Huronian rocks are again hidden by the Paleozoic cover or by Keweenawan rocks.

The chemical nature of the Upper Huronian rocks is such that they reflect rather clearly, through mineralogic changes, the degree of metamorphism to which the formations were subjected. Slates, graywackes, ironformation, and basic intrusive and extrusive rocks are good indicators of metamorphism, while high-silica sedimentary rocks are not so indicative. Compositional differences in pre-existing rocks account for some variation within the zones, but generally speaking the changes are quite uniform and well defined throughout their extent. The isothermal or isograd zones of metamorphism have been designated with increasing intensity by chlorite, biotite, garnet, staurolite, and sillimanite, or minerals of similar stabilities, with the zones varying greatly in extent. Lowgrade metamorphism is far more extensive in areal distribution than are either the intermediate or high-grade metamorphism.

The metamorphism which produced the mineralogic and textural changes in the rocks of the northern peninsula of Michigan occurred some time after the period of Upper Huronian deposition of sediments, very likely being associated with the orogeny preceding or coincident with the Keweenawan intrusions. The occurrence of more abundant granite within the area of strongest metamorphism and the discovery of more abundant tourmaline in the area of high metamorphism, where granite does not occur at the surface, point to a direct association between the metamorphism and a period of granitic batholithic intrusion which caused the metamorphism, although the igneous body has not yet been exposed by erosion. Thus, the area of highest metamorphism can be pictured as being the roof section of the granitic intrusion, with the threedimensional effect of the hidden body causing the successive zones of lesser metamorphism to extend laterally for a great distance from this locus, the distance in each case being a function of the shape of the intrusive body and of the slope of the intrusive contact.

In relation to the orogeny which produced the Marquette syncline, the metamorphic zoning appears to be later, as the zones are seen to transgress the regional folding. Basic igneous dikes which cut the post-Upper Huronian granite were apparently altered by the same period of thermal activity than metamorphosed the Upper Huronian sedimentary rocks. Portions of the area have also been influenced by retrograde metamorphism.

Certain facies within the formations reacted differently to the impact of metamorphism than did the average host 602 GEOLOGY

rocks. This was due to strong compositional differences. Of particular interest are widespread calcareous concretions which first reflect the influence of imposed thermal changes. Their excellent development of secondary minerals is of considerable aid in the delineation of metamorphic zones. Similarly, other phases within the area of high metamorphism contain a considerable amount of carbon, a condition which has caused a lag in the metamorphism of this unit, producing a "metamorphic anomaly." As noted above, further variations are shown by areas within the zones of high metamorphism which have been subjected to later retrograde metamorphism.

High grade metamorphism of the iron-formations has produced magnetite and specular hematite of large enough grain size to facilitate their liberation for "taconite" ores.

206 pages. \$2.70. Mic 57-957

GEOLOGY OF THE CASSIAR MOUNTAINS
IN THE VICINITY OF THE YUKON-BRITISH
COLUMBIA BOUNDARY

(Publication No. 20,147)

William Hope Poole, Ph.D. Princeton University, 1956

This report comprises the results of reconnaissance mapping during four summers of about 3,000 square miles of the Cassiar Mountains in southern Yukon and northern British Columbia.

About half of the report-area is underlain by low-grade metamorphic sedimentary and volcanic rocks ranging in age from Early Cambrian to Mississippian and Meso-zoic(?), and half by intrusions of ultramafic, dioritic, and granitic rocks of probable Mesozoic age.

The oldest rocks are miogeosynclinal-type rocks of early Palaeozoic age: Lower Cambrian orthoquartzite and limestone about 18,000 feet thick; known and probable

Lower Silurian thin-bedded limestone and shale about 4,000 feet thick; and Middle Devonian orthoquartzite and dolomite about 3,500 feet thick. Middle Devonian rocks disconformably overlie Lower Silurian rocks, and both are down-faulted against Lower Cambrian rocks. Upper Devonian and Mississippian eugeosynclinal-type rocks about 29,000 to 40,000 feet thick conformably overlie Middle Devonian rocks. Probable Mesozoic feldspathic quartzite, subgreywacke, greywacke, and grit about 1,000 feet thick unconformably overlie the Mississippian rocks.

In the Mesozoic, the stratified rocks were deformed by northeasterly directed compressive forces which formed several northwest-trending anticlines and synclines with axes from 10 to 20 miles apart and axial planes near-vertical. Longitudinal and a few transverse faults have down-faulted the interiors of the synclines.

Small stocks of olivinitic clinopyroxenite and dunite, and stocks of diorite, granodiorite, and quartz diorite have intruded the Palaeozoic rocks. Stocks and batholiths, dominantly of quartz monozonite and granodiorite, intrude Palaeozoic rocks and dioritic intrusions. Each intrusive body is a distinct unit at the present level of erosion. The dioritic and granitic rocks were probably magmatic intrusions post-dating regional deformation; the origin and time of intrusion of the ultramafic bodies are unknown. The Cassiar batholith and Ram stock have been partly sheared and altered by post-solidification stresses originating probably by reactivation of intrusive forces. During uplift of the granitic bodies, longitudinal faults, steepened southwest wall rocks, and anomalous 'over-turned' dragfolds and near-horizontal cleavage in slate and thin-bedded chert and argillite may have formed and erosion may have occurred. Leuco-quartz monzonite and alaskite plutons with quartz and tourmaline miarolitic cavities and concentrations are younger than all other granitic intrusions and the deformation.

Remnants of Pleistocene and perhaps late Tertiary olivine basalt flows occur in some major valleys.

279 pages. \$3.60. Mic 57-958

HEALTH SCIENCES

HEALTH SCIENCES, GENERAL

EXPERIMENTAL CANINE LEPTOSPIROSIS

(Publication No. 18,942)

Donald Gottlob Low, Ph.D. University of Minnesota, 1956

Acute experimental leptospirosis was studied in 73 dogs. The emphasis of the study was on an evaluation of renal function, though the hematological, bacteriological, serological and biochemical aspects of the disease were also investigated as thoroughly as time and facilities would permit.

A marked increase in the virulence of the organism used (L. icterohemorrhagiae, CF-1) occurred as a result of a hamster-dog-culture passage sequence. Blood depletion anemia appeared to have no effect in decreasing the resistance of dogs to experimental leptospirosis. On the basis of arbitrary criteria, the dogs were divided into four levels of infection. Subclinical infection occurred in 20 dogs, mild infections in 18, moderate infections in 23 and severe infections in 12. In dogs which survived the disease with moderate or severe infections, evidence of recovery was often apparent on the eighth day.

The plasma bilirubin, determined repeatedly in 20 jaundiced dogs, was always predominately of the direct reacting type. Urinary urobilinogen, measured in 11 dogs, did not change appreciably from pre-inoculation values. Bromsulfalein retention and plasma uric acid levels increased in proportion to the plasma bilirubin level, but offered no advantage over the plasma bilirubin level in evaluating liver damage. The jaundice in acute experimental canine leptospirosis appeared to be of hepatocellular origin.

Nitrogen retention occurred regularly in the severely affected dogs. Inorganic phosphorus retention appeared to be concurrent with nitrogen retention. The level of blood urea nitrogen was an accurate prognostic index; rapid increases were followed by death or a moribund state.

The sedimentation rate was regularly increased regardless of the severity of the disease. The hemoglobin and hematocrit usually decreased some during the first week post-inoculation. This decrease was not associated with hemoglobinemia or hemoglobinuria. Red cell survival time, measured with Cr. was essentially the same in three jaundiced dogs and one normal control animal. Leucopenia was occasionally observed early in the disease. Leucocytosis was regularly a delayed phenomenon, seldom becoming apparent before the fifth day post-inoculation.

Viable leptospires were recovered from the blood of 97 per cent of the dogs in which isolation was attempted. The duration of leptospiremia ranged from two to over nine days and appeared to correlate with the severity of the disease. Serological examination of sera revealed little correlation between titer, duration of leptospiremia and severity of the disease.

Glomerular filtration rates, estimated by creatinine clearance, effective renal plasma flow, measured by sodium p-aminohippurate clearance, and tubular maximum_{PAH} were all markedly depressed, at times to as little as 10 per cent of pre-inoculation values. It has been suggested that interference with circulation to and within the kidney may be the principal cause of renal failure though the renal tubules probably suffer additional damage due to the leptospires which localize there.

137 pages. \$2.00. Mic 57-959

STUDIES ON RADIOIODINE UPTAKE IN SURVIVING HUMAN THYROID SLICES

(Publication No. 19,222)

George Dempster Molnar, Ph.D. University of Minnesota, 1956

Slices of histologically normal human and dog thryoid glands were incubated with I¹³¹ in Krebs-Henseleit bicarbonate solution, with the use of conventional methods to insure optimal viability, physiologic pH, temperature and adequate tissue oxygen tension. Accumulated tissue radioactivity was serially determined and media were analyzed for I¹²⁷ content. About a third of tissue I¹²⁷ contents was found to have been transferred to the medium in 60 to 420 minutes. This resulted in significant lowering of the specific activity of I¹³¹ of the medium, and depressed subsequent accumulation of I¹³¹. Thus, iodine accumulation of the slice reflected the changing specific activity of the medium.

To achieve constant specific activity of medium, a method of incubation was devised in which the medium of constant composition, containing 0.2 micrograms I¹²⁷ and 4 microcuries I¹³¹ per 100 ml. flowered by gravity over slices at a constant rate, without recirculation. The flow was regulated partly by a constant pressure of gas maintained over the medium in the reservoir and partly by adjusting the stop cocks at the end of the outlet tubing to the desired rate of flow. Temperature was kept at 38°C with thermostatically controlled water baths. Radioactivity was measured with an end-window scintillation counter on which one tissue chamber at a time was accurately positioned. While the medium continued to flow measurements of radioactivity were made serially. Such serially determined accumulation of I 131 in normal tissue was rectilinear with respect to time. The slope of this line, representing the rate of I¹³¹ uptake was easily calculable. At the end of each experiment of ratio of radioactivity in rinsed, blotted and weighed slices to aliquots of the medium, as determined in a scintillation well counter gave tissue to medium ratios which showed high correlation with the calculated accumulation rate. Medium containing 10⁻³ M methimazole changed the accumulation

of I 131 from a straight line to an exponential function. Most of the I 131 in the methimazole-blocked slices was dischargeable by 10⁻² M thiocyanate. I¹³¹ accumulation rates of unblocked thyroid slices were proportional to flow rates of medium. The uptake of iodide was decreased by incorporating inorganic or organic iodine compounds in the standard medium. In methimazole-blocked slices as much as 100 micrograms I¹²⁷ per 100 ml. did not affect the I¹²¹ accumulation rate.

The proportion of I¹³¹ organically bound in the tissued

increased with duration of incubation. The method permits experimental and control observations to be made on the 90 pages. \$2.00. Mic 57-960 same tissue.

HEALTH SCIENCES, PHARMACY

A PHARMACOGNOSTICAL INVESTIGATION OF PTERYXIA TEREBINTHINA (HOOK.) COULT. & ROSE VAR. TEREBINTHINA (A BOTANICAL, PHYTOCHEMICAL, AND PHARMACOLOGICAL STUDY)

(Publication No. 19,195)

Tracey Gillette Call, Ph.D. University of Minnesota, 1956

Botanical Part

Pteryxia terebinthina (Hook.) Coult. & Rose var. terebinthina, type of the genus Pteryxia, is a perennial xeromorphic umbellifer indigenous to sandy desert areas of the Columbia Basin of Oregon, Washington, and Northwestern Idaho.

Classification and habitat of the species are discussed. Thirty associated plants were collected. Photomicrographs and photographs are presented. Gross and microscopic anatomy show large, dark drown tapering roots covered by thick, corky periderm; oleoresin-filled ducts numerous in phloem; scalariform vessels most prominent feature of xylem; root fracture sharp, weak due to relative absence of fibers. Phenomenon of root shortening present; crown branches quite variable in length, surrounded by chaffy leaf bases; oleoresin ducts in pith and phloem. The short stem and the peduncle are of ranunculus type with discrete vascular bundles separated by intrafascicular pith rays. Oleoresin ducts present between the bundles and external collenchyma ridges. Pith hollowed in internodes. Primary and secondary rays similar to peduncle except for reduced bundle number.

Pinnately or ternately decompound leaves ovate, mostly with sheathing, and less commonly, cylindrical petiole bases. Petiole and rachis structure similar to that of peduncle, except for a deep groove in adaxial side and reduced bundle number. Lamina is concentric with two palisade layers on adaxial and one on abaxial side. Spongy mesophyll scanty. Vascular bundles lead to apices of leaflets. Fruit a schizocarp with adherent mericarps. Prominent dorsal wings undulate crisped. Three to seven vittae present in the intervals; six to thirteen on the commissure.

Trichomes absent from all organs. Oleoresin ducts in almost all tissues. Considerable cyrstalline material in chlorenchyma and root phloem.

The powdered root also is described. Extractive and Phytochemical Part

Previous chemical investigations of related species are reviewed. From milled dried root, approximately eight per cent volatile oil was steam distilled. Physical constants of several lots and fractions were determined.

Ash was 8.44 and acid insoluble ash was 4.67 per cent. Separate Soxhlet extractions of powdered root with twenty-two solvents yielded extractives, of which the yields, colors, and fluorescences are described.

Two series of successive Soxhlet extractions and a percolation of powdered root were performed and extracts are described.

Most extracts, after drying, deposited crystals of a substance named pteryxin (M.P. 78-81°C.), distillable at 195° C. at less than 1 mm.; solubility 1:40,000 in water; soluble in organic solvents; density 1.22; refractive index 1.54 at 25° C. Ultraviolet absorption showed instability. Absorption spectrum similar to visnagan. Pteryxin yields a yellow color with alkali solutions. Carbon 65.97 per cent; hydrogen 6.08 per cent; molecular weight about 400; saponification equivalent 140; probable formula C22H24O7. Methoxyl group absent. Acid or base splits pteryxin yielding alpha-hydroxy butyric and/or related acid and a residue, probably a benzopyrone derivative. Pharmacological Part

Powdered Root: Mice survived a diet containing fifteen per cent of volatile oil-free pteryxia root for twelve weeks. Estrogenic effect was absent. Blood coagulation time increased from 4.75 minutes for controls to 15.33 minutes on fifteen per cent diet with other diets yielding intermediate results. Livers of mice on fifteen per cent level appeared abnormally dark on necropsy.

Pteryxin: Acute toxicity to fish (guppies) in forty minutes showed an approximate L.D.₅₀ at 1:40,000 dilution compared with 1:400,000 rotenone, 1:60,000 xanthotoxin, 1:30,000 imperatorin, 1:5,000 khellin and 1:5,000 for coumarin. Single oral dose of 2.0 Gm./Kg. caused no deaths to mice in twenty-four hours.

Oral and intravenous effect on blood pressure and respiration in cats was indecisive.

Spasmolytic action on spontaneously contracting isolated rat uteri was about twice that of khellin and four times that of papaverine hydrochloride.

182 pages. \$2.40. Mic 57-961

THE SOLUBILITY AND COMPLEXING PROPERTIES OF OXYTETRACYCLINE AND TETRACYCLINE

(Publication No. 19,089)

Eugene Howard Gans, Ph.D. The University of Wisconsin, 1956

Supervisor: Professor Takeru Higuchi

The solubility and complexing properties of oxytetracycline and tetracycline have been investigated in aqueous and non-aqueous media. The tetracyclines are rather insoluble in aqueous solution, i.e. ca.10⁻⁴ moles per liter. and the presence of many neighboring protophilic and protodotic groups on the molecule suggests that intraand intermolecular hydrogen bonding may be largely responsible for the poor aqueous solubility characteristics.

Solubility phase diagrams have been employed to follow oxytetracycline and tetracycline systems containing neutral and charged molecules.

In aqueous systems at 25° C. both oxytetracycline dihydrate and tetracycline trihydrate formed soluble interaction species with sodium salicylate, sodium p-hydroxy benzoate, sodium saccharin, sodium p-amino benzoate, caffeine, and N-methyl pyrrolidone. The comparative extent of the interactions are roughly in the order listed above and in all cases the interactions with tetracycline trihydrate were greater than those with oxytetracycline dihydrate. With the exception of those for the caffeine systems, the solubility curves showed considerable sigmoidal character and strongly resemble hydrotropic solubility curves. In dilute solution, the interactions can be described by the equation of the type: log y = log b + alog x, and the slopes of the respective curves indicate that an increase in tetra- or oxytetracycline solubility is cocomitant with an increase in the complexing agent dependency.

Two procedures for the preparation of the base hydrates of the tetracyclines have been described. The first utilizes sodium acetate to neutralize solutions of the respective hydrochloride salts and the second method involves recrystallization of the base hydrates from N-methyl pyrrolidone.

Due to the different solubility characteristics of anhydrous oxytetracycline and tetracycline, the interactions in non-aqueous media were carried out using chloroform as the solvent for anhydrous oxytetracycline and carbon tetrachloride for anhydrous tetracycline. At 25° C., both tetracycline species formed soluble interaction species with N-N'-dimethyl acetamide, N-methyl pyrrolidone, and gamma-valerolactone; the comparative degree of interaction being approximately in the order listed. With gamma-butyrolactone, oxytetracycline formed soluble species, while both soluble and insoluble species resulted with anhydrous tetracycline. The isolacted insoluble tetracycline-butyrolactone complex, upon analysis, showed a stoichiometric ratio of 1:1, although other species are probably present in solution. All the soluble interactions, with the exception of oxytetracycline-N-N'-dimethyl acetamide at higher concentrations, showed the following linear relationship: $\log y = \log b + a \log x$. The slopes of the straight lines indicated that the interactions were approximately first order with respect to the complexing agents.

Comparison of the aqueous and non-aqueous interactions with N-methyl pyrrolidone indicated that the activity of a particular complexing agent appears to increase with a decrease in the polarity of the solvent system.

The complexing agents used herein were all examples of compounds containing relatively strong negative centers. The activity of any such agent appears to be related to its ability to compete favorably with the propensity of the tetracyclines to form intra- and intermolecular hydrogen bonds. Comparison of the data also indicates that other factors, perhaps steric in nature, may play an important role in determining the extent of interaction.

136 pages. \$2.00. Mic 57-962

HEALTH SCIENCE, SURGERY

THE EFFECT OF HYPOPHYSECTOMY ON EXPERIMENTAL ASCITES

(Publication No. 18,977)

Robert Leslie Craig, Ph.D. Northwestern University, 1956

Chairman: Loyal Davis, M.D.

When about one-half the tricuspid valve of the dog is removed and two weeks later the pulmonary artery constricted to about one-half its diameter, a massive ascites develops within a period of several weeks. Accompanying the development of ascites is an increase in water intake and a diminution of urinary output together with a marked restriction in the amount of salt excreted in the urine. When the pituitary gland is removed at the point when ascites is massive and grossly apparent, the accumulation of fluid is reversed. Several weeks after hypophysectomy, the weight and girth of the experimental dogs returns to nearly normal values. Accompanying this loss of ascites is a voluntary restriction of water intake and a return of urinary output as well as urinary salt to nearly normal values.

It would appear that the pituitary gland exerts a definite effect on the fluid accumulation which occurs in experimental ascites.

A total of 61 dogs were used in the experiments. A sample protocol of one dogs is included in the appendix of the dissertation. The remaining protocols of all animals have been microfilmed and are on file in the Library of the Medical School.

69 pages. \$2.00. Mic 57-963

HISTORY

HISTORY, GENERAL

CALENDAR OF THE LANDON CARTER PAPERS IN THE SABINE HALL COLLECTION AND A BIOGRAPHIC SKETCH OF COLONEL LANDON CARTER

(Publication No. 19,650)

Walter Ray Wineman, Ph.D. University of Pittsburgh, 1956

The Landon Carter papers in the Sabine Hall Collection were not available to students until a few years ago. In 1943 the present heir of the estate deposited the papers with the Manuscripts Division of the University of Virginia Library. This group of papers includes the land title papers of Colonel Landon Carter, his personal correspondence, and the drafts of his published writings.

A calendar of these manuscripts was prepared with two objectives. The first of these was to present the information contained in the papers in a form which would be usable to those persons interested in the history of eighteenth-century Virginia. The second objective was to relate the information in the manuscripts to the life and activities of Colonel Carter.

In the preparation of the calendar, each of the papers was identified by its date and the names of the principal parties mentioned. The items were then arranged in chronological order. The identification was based on information obtained either directly from the manuscripts or was determined as a result of collateral research.

After each item had been identified, its contents were summarized and its relationship to the other papers noted. Added to the summary were comments indicating the individual significance of the item or the manner in which it was related to Landon Carter.

In order to gain perspective necessary for an understanding of the papers, a study was made of the life and activities of Colonel Carter. On the basis of the information developed in this study a biographic sketch was prepared.

This biographic study centered around three major areas of concern. These were: (1) the personal and family background of Landon Carter, (2) his conduct as a member of the landed gentry of eighteenth-century Virginia, and (3) his political activities during the period of the American Revolution.

In assessing the personal and family background of Colonel Carter, particular attention was paid to the development of the Carter family in Virginia and to Landon Carter's relative position in that family. This appraisal considered both the resources of the family and the contributions which its members made to society.

The second phase of the study indicated the manner in which Colonel Carter related himself to the people around him. Attention was also given to the intellectual and scientific interests which he exhibited as a member of the enlightened aristocracy of the eighteenth-century Virginia.

His political philosophy was interpreted and a determination was made of the extent to which he influenced the course of political events in the colony.

The analysis of the Landon Carter papers indicates that the Sabine Hall Collection constitutes an important source of information on the early history of Virginia. The information developed in the biographic sketch points up the significant place which Landon Carter held in the society of eighteenth-century Virginia. In a more general way, the information adds to the understanding of the role which his type of conservatism played in the course of the American Revolution. 124 pages. \$2.00. Mic 57-964

HISTORY, ANCIENT

THE LIFE AND REIGN OF COMMODUS

(Publication No. 20,165)

John Charles Traupman, Ph.D. Princeton University, 1956

The purpose of this study is to determine, with the aid of evidence from epigraphy, papyri, numismatics, and archaeology, the accuracy of the literary tradition dealing with the person of the Emperor Commodus and with his administration of the empire. According to the literary account, the Roman empire witnessed a reign of almost unrelieved terror, in which the governmental machinery was radically disrupted by vicious ministers, the State finances were reduced to a condition of bankruptcy through the extravagance of the court, and the defenses of the empire were abandoned through the supineness of the emperor.

The first chapter is devoted to a portrayal of Commodus during the formative years and attempts to identify the various factors which had a preponderant influence upon the personality of the heir-apparent and to trace the steps which Marcus Aurelius took to advance his son to full partnership in the empire. In the second chapter the major events of the reign of Commodus are discussed, for the most part in chronological order. An attempt is made to interpret the activities of Commodus in Rome in the light of his religious policy. In the next section the fragmentary and scattered evidence for the various departments of the administration is collected and evaluated. A final chapter investigates the foreign policy of Commodus and the system of defense.

The general conclusion is that the literary tradition presents an unbalanced picture of the conditions that prevailed during the reign of Commodus. Although the damnatio memoriae, which was pronounced upon Commodus by the Senate after his death, led to the wilful destruction of both public and private records and monuments, there

is enough evidence to prove that the governmental machinery was not radically changed or disrupted. Because of his youth and inexperience, Commodus chose to invest his pretorian prefects with unusual power rather than to court the favor of the senatorial aristocracy. Although this course of action may be regarded as excusable in the opening years of the reign, it must be conceded that in the course of time this extensive delegation of authority resulted in abuses on the part of subordinates and proved an inadequate substitute for close personal supervision. On the other hand, the majority of those who held offices of importance in the central government or who were sent into the provinces were men of experience and responsibility. Special attention was given to the construction of adequate defenses on the frontiers.

Many of the measures taken by Commodus appear to be without sense or motive unless they are viewed in terms of his religious policy. Having lost the support of the senatorial aristocracy, Commodus sought security for his person and a new basis for his authority in the dogmas of oriental religions, especially Mithraism, and the popular cult of Hercules. Recognition of this fact is fundamental to an understanding of the period as a whole.

226 pages. \$2.95. Mic 57-965

HISTORY, MEDIEVAL

FERNÃO LOPES, LATE MEDIEVAL PORTUGUESE CHRONICLER

(Publication No. 20,094)

Nathan Adams, Ph.D. Princeton University, 1956

Fernão Lopes was the official chronicler of the Portuguese royal court, and yet in his chronicle he expresses a lower class point of view. This incongruous combination of circumstances was possible only in the unique period of Portuguese history in which Lopes lived. The central event of his chronicle is the popular revolt at Lisbon in 1383 which eventually set a bastard scion of the royal family on the Portuguese throne in place of the King of Castile to whom it belonged by hereditary right. The ensuing war was both a national and a class conflict. The middle class and especially the common people supported the national cause against the Castilian king, whereas despite national considerations the feudal class mostly remained loyal to their rightful lord. The final victory of the national cause brought destruction to the feudal class and great flexibility to the social structure, with people of humble origins rising to take the places of their former leaders. Lopes was one of those who gained.

Lopes evidently came originally from the artisan class of Lisbon. A notary, he became private secretary to princes, serving for 36 years as keeper of the royal archives. He was commissioned to write a chronicle of Portuguese history, particularly the rise of the House of Avis, and for this work received a royal pension. Official sponsorship and the author's humble origins can both be detected in his chronicle.

Lopes' general point of view is complex and sometimes contradictory. Though much of the chronicle is devoted directly to legitimatizing the dynasty's rise to power, with its right to the throne sanctioned by both legal and supernatural evidence, Lopes emphasizes the role of the common people and the city of Lisbon, stressing their sufferings in the long struggle against Castile more than the heroism of the knights. He treats his first patron, John of Avis, and most other figures realistically, but idealizes as a Christian knight Nun' Álvares, military leader of the national cause.

Despite his obvious sympathies, Lopes was a competent historian. He wrote graphically, particularly of personalities and mobs, and openly discussed problems of sources and bias. As royal archivist he could use documents to check narrative sources. Though he sometimes suppressed or misinterpreted, Lopes generally used his sources honestly and with some critical sense. His interests extended to finance, agriculture, royal justice, and such historical problems as causation and individual freedom.

The chronicle also helps toward an understanding of the period of change in which Lopes lived and wrote. If his writings are indeed representative of his age, early fifteenth century Portugal must have been closer in spirit to the Middle Ages than to the Renaissance. His is the simple, spontaneous language and style of the medieval storyteller; he turns to authorities to support his contentions and more often than not the authority is Cicero, the Bible, or the Church Fathers.

The chronicle's literary background is drawn mostly from the story of King Arthur and his knights, and Lopes' exposition of the political theory of government by consent is cast in similarly medieval terms. More suggestive of the Renaissance are his fervent nationalism and the indications that he may hold to a cyclical theory of history. Lopes quotes one of Petrarch's letters, but while new ideas were coming into Portugal, the old pattern still predominated.

Fernão Lopes is not only an important figure in European historiography, but also the principal source for understanding a transitional period unique in Portuguese history.

476 pages. \$6.05. Mic 57-966

A HISTORY OF THE MUSCOVITE CIVIL WAR: THE REIGN OF VASILI II (1425-62)

(Publication No. 20,097)

Gustave Alef, Ph.D. Princeton University, 1956

The purpose of this study is to examine the origins, development and significance of the only civil war within the Muscovite principality. The struggle was precipitated by the challenge of an uncle to the succession of his nephew on the grand princely throne. The death of the challenger (whose claim was debatable) did not end the dispute. For another nineteen years the struggle continued intermittently, with no pretense to legality, with increasing savagery, involving most Muscovite inhabitants as well as neighboring powers. Moscow almost lost its position as the strongest power in northern Russia, and as unifier of

the Russian lands; but it emerged more powerful than any of its neighbors.

Unlike its bordering rivals, Moscow had experienced no internecine feuds among its family princes for almost a hundred years. This was precisely the period when Moscow evolved from an insignificant princedom to the preponderant power. Many theses have been presented to account for this transformation. One vital factor, however, has been almost completely overlooked: the death rate in the Moscow family was so high that the dynasty barely maintained itself. When the inheritors to the family patrimony increased sharply at the end of the fourteenth century, an internecine struggle was foreordained. This element helps to explain the stability and strength of Moscow in the fourteenth century.

Civil war destroyed previous concepts of rule based upon cooperation and respect among the related quasiindependent princes.

Attempts to end the severe internal upheaval affected both church and state. The clergy, leaderless since the deposition of Metropolitan Isidor in 1441, were divided in their sympathy in the princely strife. The need for a unified church was acute, with a primate who would excommunicate the rebels. Notwithstanding clerical and imperial teaching, an autocephalous church sprang into being, not because it was meant to repudiate Byzantium, as is commonly believed, but to strengthen the secular power.

Simultaneously other weapons were forged. To assert the principle of succession and to safeguard the position of the senior Moscow prince, in the event that the elder grand prince should die or be captured, his eldest son was coopted. The attempt was also made to elevate the senior prince above his former level, through the assumption of the title of sovereign. What at first was a hollow claim, later was filled with the substance of power. By the end of the reign the senior prince exercised greater authority over a larger area than any of his predecessors. Wartime enemies were expropriated, jailed or in exile. Customary rights of patrimonial princes and corporate rights of servitors, were greatly diminished in favor of the central authority, laying the foundation for the subordination of two important classes of society. The considerable land of the Viatchane was annexed for having aided the grand prince's enemies; the huge territory of Novgorod was, for similar reasons, placed under Muscovite control.

Simultaneously, with the successful resolution of the civil war, the Byzantine empire was engulfed, leaving Russia as the only Orthodox center free of external domination. The Tatar overlordship had all but collapsed, and had been rejected in fact with the unilateral co-optation of 1448. This combination of developments led inevitably to the creation of the Moscow tsardom. Thus, to the heritage of Byzantium and the Mongols, must be added the oft neglected internal evolution of Moscow, in the course of which the civil war played an essential role.

544 pages. \$6.90. Mic 57-967

KARAITES IN BYZANTIUM: THE FORMATIVE YEARS (970-1100)

(Publication No. 20,049)

Zvi Ankori, Ph.D. Columbia University, 1956

The present study constitutes the first attempt to reconstruct the formative years of Byzantine Karaism, from its earliest appearance on Byzantine soil to the First Crusade.

The beginning of Karaite movement in Byzantium may possibly be linked to the successes of Byzantine arms in the East in the latter half of the tenth century. These brought about the annexation into the Empire of large territories of Syria and Northern Mesopotamia in which Jewish (Rabbanite and Karaite) communities resided. Thus, international circumstances have transplanted Karaism, the product of Jewish experience under medieval Islam, into the soil of a Christian State. Not only did old and well-established communities come under imperial rule, but also the way was open for immigration westwards, into Asia Minor and Constantinople. Yet, while the Rabbanite population in the native-Byzantine communities merely increased through the influx of immigrants from the East, to the Karaites it meant the creation of entirely new outposts within new geographic and cultural horizons and the need for adjustment to a new environment. Our story deals in detail with this process of Karaite expansion and adjustment.

The sectaries formed predominantly an urban element. Composed at first almost exclusively of merchants, they expanded along the nation's main arteries of trade. Gradually, however, they developed a diversified socioeconomic structure similar to that of their Rabbanite neighbors.

Communally, Byzantine Karaites enjoyed a definitive religious autonomy within the general framework of the Jewish community. Our revised chronology points to Tobias ben Moses as the first leader of Byzantine-Karaite autonomous institutions, not later than the fifth decade of the eleventh century.

The need for adjustments to the new conditions and the living example of Rabbanite practices brought forth important modifications in the interpretation of some Karaite legal principles. On the other hand, the Rabbanites, too, could not escape the impact of daily contacts with their new neighbors. Close contacts encouraged not only mutual borrowings but also polemics and actual feuds. Tobias ben Eliezer, the Rabbanite homilist and leader, led an angry fight against the encroachments of Karaism on the traditional way of life. Especially periodic divergences in matters of calendation caused open friction between the two branches of Jewry.

Constant relations with Palestine were regarded by the Karaites as a quasi-religious obligation. Students from the Empire would study in Jerusalem and even join the Order of the "Mourners of Zion." In the middle of the eleventh century these disciples of Palestinian masters initiated an ambitious project of translating Karaite-Arabic classics into Hebrew. This project was designed to emancipate Byzantine Karaism from the Arabic garb which had clung to the movement for the past hundred years and more. The new generations of native-born Byzantine Karaites considered such a garb alien to them and incompatible with

the Greek climate of the country which they called their own. Such local literary creativity which, much like that of the Rabbanites, employed Hebrew with Greek glosses appended, marked also a conscious effort by local Karaism to counter Rabbanite insinuations of Karaite 'foreignness' and lack of scholarly attainment. However, the Karaite Greek glosses show more familiarity with classical Greek terms and a considerable Greek literacy. This may have been the result of Karaite appearance on the Byzantine scene precisely when the Empire as a whole was experiencing a classicist revival. At the same time a Greco-Karaite jargon developed which survived among the Karaites of Turkey to this day.

The formative years of Karaism in Byzantium laid the foundations for the shift of the Karaite movement from the Near East to the countries of Eastern Europe.

334 pages. \$4.30. Mic 57-968

THE ROLE OF FRANTIŠEK L. RIEGER IN NINETEENTH CENTURY CZECH POLITICAL DEVELOPMENT

(Publication No. 16,942)

Stanley Zdeněk Pech, Ph.D. University of Colorado, 1955

Supervisor: Professor S. Harrison Thomson

František L. Rieger appeared on the political scene of Bohemia in 1848, and his rise to a position of leadership among the Czech people coincided with the opening of the constitutional era in the Austrian Empire in 1860. Thereafter, Rieger was at the helm of Czech politics until 1891; although he nominally shared this position with the historian Palacký until the latter's death in 1876, the de facto leadership and the everyday conduct of business were in Rieger's hands.

Rieger belonged to the first generation of political leaders who lifted the Czech nation from the paralysis of pre-1848 absolutism. Nurtured by the romanticism of the first half of the nineteenth century, he rose into prominence as a skillful orator in the Austrian Reichstag in 1848-1849. During this period he displayed strong liberal tendencies, as evidenced for instance by his defense of the principle of popular sovereignty and by his opposition to the privileges of the nobility. In 1863 the Czech deputies, unable to obtain consideration of their demands, withdrew under Rieger's leadership from the Reichsrat in Vienna and began their passive resistance which lasted for sixteen years. Throughout his career Rieger was one of the principal exponents of federalism which would accord a position of equality to the various nationalities in the Austrian Empire, and consequently fought the Austro-Hungarian Compromise of 1867. In the same year he took a leading part at the Slavic Congress in Moscow, and in 1869 he submitted to the French Emperor Napoleon III the famous secret memorandum on the political situation in Austria which was later published and which stirred a considerable controversy. With Count Clam-Martinic Rieger played a leading role in negotiations for a German-Czech Compromise in 1871 which ended in failure largely because of German opposition. With the entry of Czech deputies

into the Reichsrat in 1879 Picger's popularity began to decline. Although he secured some valuable concessions for the Czechs, he became intensely dynastic and pro-Hapsburg in his views. Influenced by an informal alliance with the nobility, concluded in the sixties, he now drifted into an extremely conservative position and fell increasingly out of tune with advancing concepts of democracy. The German-Czech agreement of 1890, which he helped negotiate and which was regarded by the Czech people as detrimental to their interests, precipitated his downfall. In the election of 1891 Rieger and his National party, sometimes called the Old Czech party, were swept away from the political scene.

Though primarily a politician, Rieger fostered cultural advancement of the Czechs; he regarded cultural progress as a prerequisite for political success. He stood at the cradle of many Czech cultural institutions and contributed to the development of Czech schools. In 1882 a Czech university was established in Prague, chiefly as a result of his efforts. His party gave the people a program which in its main outlines was realized after World War I, and which envisaged the union of the Lands of the Bohemian Crown and the union of Czechs and Slovaks. Rieger's zeal was not always matched by a critical attitude; he often let his heart govern his reason and was thus led into inconsistencies and blunders. Among these was his memorandum to Napoleon III and his stubborn adherence to the policy of passive opposition. Rieger's excursions into the domain of foreign relations of Austria yielded few benefits and harmed Czech prestige in the Empire. In judging the merits of his policy we must remember the difficulties his nation faced, notably the fact that he belonged to the first generation of leaders who had no recent political tradition to build upon and who had to work out new con-

303 pages. \$3.90. Mic 57-969

HISTORY, MODERN

cepts and policies by trial and error.

THE SENATORIAL CAREER OF JOHN TYLER MORGAN

(Publication No. 19,732)

James Marvin Anders, Ph.D. George Peabody College for Teachers, 1956

Major Professor: Jack Allen

John Tyler Morgan, lawyer, Confederate General, Democratic Senator and statesman was a member of the Senate from 1876 to 1907. He was a commanding figure on the national scene, as well as in Alabama history. He was an eloquent defender of the South against attacks of Northern Senators. A firm advocate of state-rights, he also believed in white supremacy and helped defeat the "Force Bill" of 1890 by a lengthy filibuster. But his complete independence of thought and national viewpoint kept him from being merely a blindly loyal state-rights Democrat.

Perhaps no subject during John Tyler Morgan's senatorial career absorbed more of his time and energies than that of an interoceanic canal. He was one of the early advocates of an Isthmian canal and waged a long fight against the groups that opposed such a project. He favored the Nicaraguan route because of its proximity to Southern ports and introduced a series of bills supporting this route. Probably the greatest disappointment of his legislative career was the selection of the Panama route as the site for the canal. He was the acknowledged leader of the Nicaraguan faction and directed a skillful campaign against the Panama "lobby". He firmly believed to the last that Nicaragua afforded indisputable advantages. Though the route he championed was not chosen, Morgan's unceasing labor for a canal cannot be written off as misguided efforts. It is scarcely too much to say that, but for his courage and zeal, the building of a canal would have been delayed, possibly for decades.

Probably Morgan's greatest effectiveness in his Senatorial career was displayed in the field of foreign affairs. He was a member of the Foreign Affairs Committee for the greater portion of the time he was in the Senate. In 1892 he was appointed to a Tribunal of Arbitration to settle the differences arising from the Bering Sea Controversy. He ably upheld the American case and was the only member to vote against Great Britain on every major question. Morgan was in the vanguard of the expansionist sentiment arising in the last decades of the Nineteenth century. He supported the annexation of Hawaii even though Cleveland opposed it. After annexation occurred, Morgan's interest in the islands was recognized by his appointment to a Hawaiian Commission to provide a government for the new territory.

The period since 1865 saw the shift of economic emphasis from agriculture to manufacturing and industry. Since Morgan was a member of a minority party most of the time, and represented an essentially agrarian state, his position in the field of economic legislation was generally one of opposition rather than positive results. He opposed high tariff and fought four major tariff bills during his career. He supported the silver issue and his staunch views on this question led him into complete opposition to Cleveland, his own President. In fighting the growing power of the railroads Morgan achieved more positive results. Two years after he entered the Senate he introduced a series of bills to reclaim unearned land grants from the railroads which resulted in a saving of millions to the government. Later, as a member of the Pacific Railroads Committee, he worked on the problem of the Pacific Railroad indebtedness to the government.

Guided by a deep sense of duty, John Tyler Morgan's integrity, hard work and intellectual honesty reflected credit on his state and nation. His career is an example of active and unselfish service. It could be said that the high principles for which he stood with courage and resoluteness were as real a contribution as the more concrete and tangible.

225 pages. \$2.95. Mic 57-970

THE HISTORY OF VIET-NAM FROM THE FRENCH PENETRATION TO 1939 (PARTS I-III)

(Publication No. 17,524)

Chester Arthur Bain, Ph.D. The American University, 1956

The history of Viet-Nam has been larely neglected by Western scholars. This study attempts to fill the need for a history in English of the impact of France upon Viet-Nam prior to World War II. The sources researched were very largely French, but effort has been made to avoid pro-French bias. The subject is developed in historical sequence. To provide a framework for evaluating French rule, about one fifth of the book is devoted to a survey of the pre-French history, government, religion, laws and social system of Viet-Nam, together with a summary of the development of French colonial policies. An anotated bibliography is included.

For 1000 years Viet-Nam was a Chinese province, and after achieving independence in 937 A.D. she remained another 1000 years subject to Chinese cultural influence, becoming thoroughly sinicized. By 1858 Viet-Nam had a sizable empire ruled by an emperor through a Chinese type mandrinal system. The basic unit of government, however, was the self-governing village, while the social unit was the patriarchal family, held together by the ancestor cult.

During her colonial history, France developed no clear colonial policy, but vacillated between pro and anticolonialism and between varying administrative policies. This vacillation continued during France's conquest and rule of Indo-China. The invasion of Viet-Nam in 1858 began as a religious crusade, but ended with the annexation of Cochin-China. Subsequently, intrigues of officials and adventurers led to clashes in Tonkin and the progressive assertion of a protectorate over Annam and Tonkin, by 1884, although Vietnamese resistance continued a decade thereafter.

French administration wavered between assimilationist and associationist policies. Even when avowedly associationist, there was a strong tendency toward cultural assimilation. Governor General Doumer developed a strong central government leaving little initiative to the states, but after him there was increasing decentralization. Through most of the period the trend was to reduce the powers and prestige of the Vietnamese officials and to rule directly with French officials. This, with the introduction of French education, laws and administration, nearly destroyed the Confucian based mandrinal system and weakened the village and family structure.

The French introduced modern medicine, built roads, railroads, telegraph lines, ports, and hydraulic works and developed natural resources with new industries, mines and plantations. Yet most of the profits of the new enterprise did not benefit the Vietnamese. The French virtually monopolized the larger industries while the Chinese dominated the smaller. The bulk of the Vietnamese remained rice farmers, but were less prosperous because of the changes around them. Increased taxes, the demands of government monopolies, the destruction of handcrafts and the introduction of a money economy drove the peasant into debt or off his land.

After their resistance to France collapsed, many mandarins had tried to collaborate with their conquerors, only to see their powers and prestige erode away. Some younger nationalists turned to Western Education in hopes of winning independence by reform in collaboration with France, but others hoped to win by revolution. Repeatedly French officials lifted the reformists hopes, only to drop them again by policy changes and repressions. In the 1930's political ferment was fanned by economic depression. By 1939 the reformist movement was nearly dead. The revolutionary movement, weakened by division, had apparently been driven thoroughly underground, as France reverted to military men as Governor-Generals in the face of oncoming war.

557 pages. \$7.10. Mic 57-971

THE CORPS LÉGISLATIF DURING THE SUPREMACY OF NAPOLÉON THE FIRST, 1799-1813

(Publication No. 19,078)

Carleton Edgar Curran, Ph.D. The University of Wisconsin, 1956

Supervisor: Professor Chester Penn Higby

The object of this thesis was to examine the history of the Corps Législatif during the supremacy of Napoléon Bonaparte. Particular attention was paid to the organizational and procedural development of the Corps Législatif. The extent to which the assembly controlled these aspects of its existence, and the effect of the changes and mutations that occurred during the period covered in the thesis, are the principal concern. Although it does not ignore the significance of many laws considered by the Corps Législatif, this work does not attempt to discuss the multitude of legislative accomplishments of the period.

The power of the Corps Législatif, according to the Constitution of the Year VIII, was limited to the duty of accepting or rejecting laws presented to it by the Government. Nor did the Corps Législatif have any control over the length of its sessions, for the annual duration of the sessions was established by the Constitution of the Year VIII. However, the Corps Législatif did have control of its own organization, and to a certain extent, over the procedure which it followed when it considered the projects of law presented to it.

The major consideration of the thesis is the constant diminution of the authority of the Corps Législatif. The Government accomplished this end by use of the Sénatus-Consulte. The Constitution of the Year VIII did not specifically grant to the Conservative Senate the power to alter the Constitution; however, the Senate was designated as the supreme arbiter of any questions relative to constitutionality of laws. Napoléon, as early as December, 1800, realized the potentialities of the Sénatus-Consulte, when he first suggested that a Sénatus-Consulte, rather than an ordinary law, be issued to establish the special tribunals to mete out justice to the conspirators of the plot of the third of Nivose. A precedent was established. The Sénatus-Consulte took priority over the Constitution, and, therefore, could be employed to make alterations of the Constitution.

The Sénatus-Consultes of August 4, 1802; December 20,

1803; May 18, 1804 and August 19, 1807 substantially altered the powers and prerogatives of the Corps Législatif. The four Sénatus-Consultes listed above were milestones in the history of the Corps Législatif during the period. Other similar decrees also affected the importance and power of the assembly.

In 1802 the Corps Législatif was stripped of the assurance of a regular annual session, for the Government obtained the prerogative of determining when, where and how long a session lasted. At the same time the right to vote treaties as projects of law was lost to the Corps Législatif. The Sénatus-Consulte of 1803 established the right of Napoléon to appoint the Presidents and the Questeurs of the Corps Législatif from candidates presented to him by the Corps Législatif. The executive branch of the Government thus controlled the organization and procedures of the Corps Législatif by means of the Sénatus-Consultes, and also could use the same instrument to legislate if it so wished.

Thus, the Corps Législatif was completely at the mercy of the Government. The Government could regulate its organization and procedure, as well as its membership and duration of its session. The Government could legislate without the Corps Législatif. It was natural that the Corps Législatif developed into an institution of sycophants. Even at the last session of the Corps Législatif, when it dared to exhibit a trace of independence, the nullity and futility of the assembly was emphasized by the ease with which the Government dispensed with the services of a mildly recalcitrant assembly. A weak beginning led inexorably to a helpless ending.

394 pages. \$5.05. Mic 57-972

DENIS KEARNEY, A STUDY IN DEMAGOGUERY

(Publication No. 19,923)

Frank Michael Fahey, Ph.D. Stanford University, 1956

The political career of Denis Kearney from 1877 to 1880 demonstrates the high potential of demagoguery on the American scene. The discrepancy between aspiration and fulfillment during California's early period of statehood, brought to a clear focus by the depression of the 1870's, enabled Kearney to exert upon his contemporaries an influence completely disproportionate to his merit as a statesman. The interaction of large business enterprise and political democracy, both at a stage of rampant adolescence, in a frontier area of magnificent physical resources, provided a fertile field for the demagogue's art. The unhealthy emphasis upon speculative mining, the nearmonopolization of the state's transportation by the Central Pacific associates, the concentration of much of the land in the hands of a few large holders, the severe economic pressures engendered by the influx of Chinese immigrants, the sudden rise of an ostentatious plutocracy, and the denigration of politics by corruption and irresponsibility, all shared in creating a climate of intense popular dissatisfaction.

Kearney, an Irish-American drayman of conservative background, capitalized on these grievances to create for himself a position of surprising political power. Within a year, he mobilized most of the electorate of San Francisco in support of his Workingmen's Party of California, and, in the face of the united opposition of both major parties, came close to electing a majority of the delegates to the state constitutional convention of 1878-1879.

The explanation of Kearney's spectacular political career rests not only in the deep malaise underlying the brilliant surface of California society but also in Kearney's skill in exploiting the forces of discontent. He made effective use of the martyrdom arising from his imprisonment to pose as a champion of popular liberty. His oratory, replete with raw humor, profanity, and violence of word and gesture, stirred his followers' sense of the dramatic, as did the pageantry of torchlight parades and the swagger of military clubs. Much of his success lay in his feats as a manipulator--his ruthless suppression of intraparty opposition, his clever utilization of a basically hostile press, his effective application of economic and political pressures, and his artful conversion of the errors of his opponents to his own advantage. He played upon the prejudices of his listeners, intensifying their hatred of the convenient scapegoats of the era--the Chinese, the capitalists, and the old-line politicians, whom he linked in a common pattern of villainy. Posturing as a revolutionary agitator, he pursued in actuality a mild course of action and channeled the violent resentments of his adherents to partisan advantage. By a varied and omnipresent appeal to the emotions, he created in his followers a vision of himself as a great paternal leader, embodying the will of the people, assailing the sources of their frustrations, and soothing their fears.

Gradually, Kearney's personal defects--his egotism, cowardice, opportunism, and lack of long-range goals-became evident to increasing numbers of his followers. His popularity suffered from the mediocre, even ridiculous, record of the party delegates at the constitutional convention, from his failure to nationalize the movement, and, above all, from the improvement of economic conditions which reduced the appeal of his negative approach. The presidential election of 1880, by raising the issue of affiliation with other parties, divided the Workingmen and caused Kearney's demise as a political leader. He soon resumed his career as a successful entrepreneur, leaving unanswered the question of what might have happened had the acute depression of the 'Seventies lasted longer or had Kearney combined a more constructive program and a less vulnerable character with his tactical skill as a demagogue.

A penetrating chapter in Bryce's American Commonwealth and an article by Henry George in The Popular Science Monthly of August, 1880 offer the best treatments of Kearney's career. However, these accounts are, of necessity, brief and make little effort to study the interaction between Kearneyism and its milieu. As Bryce suggested, the facts underlying the movement can only be learned through the study of local newspapers, an endeavor largely neglected by contemporary writers. This dissertation makes extensive use of such sources and examines the relationship between the demagogue and his environment.

330 pages. \$4.25. Mic 57-973

A HISTORY OF THE YEARS OF AGRARIAN UNREST, 1865-1896, PREPARED FOR HIGH SCHOOL USE (PARTS I AND II)

(Publication No. 17,647)

Julian Burns Graham, Ed.D. New York University, 1956

STATEMENT OF PROBLEM

To prepare supplementary teaching material for use in a senior high school classroom in American history on the years of agrarian unrest, 1865-1896, based on the scholarship made available since 1930.

SIGNIFICANCE

Any exclusive reliance on a single textbook in American history classrooms is inadvisable. High school students tend to accept what they read without question unless they are shown that historians can and do differ on the interpretation of factual data. A textbook author cannot be expected to keep informed on the newer interpretations in every phase of American history; space limitations prevent him from including the background material that would make the era come alive for the students. A collateral reading program should be designed to overcome the shortcomings of the textbooks. Unfortunately, in only a few phases of American history is additional reading material geared to a high school level available. In most cases the students can only be referred to the scholarly histories which were written for an adult audience of limited size. There is a great need for reading material in secondary school American history courses that can adequately bridge the gap between the textbooks and the advanced studies.

The current debate on federal farm policy demonstrates the need to provide students with a background that would enable them to properly assess the conflicting viewpoints. Modern agricultural practices emerged in the period when the farmers abandoned an isolated, self-sufficient existence in favor of commercial farming under the joint stimuli of the Agricultural and Industrial Revolutions. The dislocations that accompanied the change drove the farmers of the nineteenth century to organize a series of protest movements. They failed in their immediate objectives, but they laid the groundwork for much of the agricultural and general reform legislation of the twentieth century.

PROCEDURE FOR GATHERING MATERIAL

Since the emphasis was on the newer interpretations, a bibliography of writings since 1930 on the years of agrarian unrest was compiled from the standard references. The writings were then examined for evidences of newer or conflicting interpretations. Whenever investigation disclosed that recent historians had not modified earlier interpretations on a particular period, the earlier writings were consulted.

PREPARATION OF MATERIAL FOR HIGH SCHOOL USE

The subject was comprehensive enough to justify the preparation of a book length document. Two natural divisions emerged, the first dealing with the changing world of the farmers in the nineteenth century and the second

with the agrarian revolts of the last three decades of the century. Part I dealt with the effects of the Industrial and Agricultural Revolutions on the life of the agricultural workers, the migration of the farmers onto the western prairies, and the living conditions of the farm families. The western farmers dominated the agrarian revolts and their activities received the major attention. Chapter V was reserved for a discussion of newer or conflicting interpretations on the Turner thesis, the safety-valve theory, and the federal land grant policies as a lesson in the critical evaluation of historical judgements.

Part II described how the farmers organized to secure a measure of relief from the problems that the industrialization of America forced upon them. In the 1870's they organized the Grange and the Greenback party; in the 1880's they flocked to the Alliances; in the 1890's they first crusaded under the banner of the Populists and later merged with the Democrats behind Bryan. The story of each campaign is related; the closing chapter shows how what the farmers did affected later developments.

463 pages. \$5.90. Mic 57-974

THE NATIONAL CIVIC FEDERATION: AMERICAN BUSINESS IN AN AGE OF SOCIAL CHANGE AND SOCIAL REFORM, 1900-1910

(Publication No. 20,122)

Gordon Maurice Jensen, Ph.D. Princeton University, 1956

Organized in 1900 as the brainchild of Ralph M. Easley, a professional reformer, who, in his previous experience had acquired the habit of working with important people, the National Civic Federation from the first was intended to be an organization for the established and conservative elements in society. Simultaneously, a sizeable number of American business men were beginning to rethink some of their established notions about society, influenced by a wide variety of factors. These men, primarily men of big business, found in the National Civic Federation, composed of representatives of business, labor, and the public, an ideal medium for expressing their new interests and attitudes, and through it they played an active and positive role in the age of social reform which lay ahead.

Led by its business members, the National Civic Federation, between 1900 and 1905, concentrated its efforts upon the problem of improving the relations of capital and labor. It sought to do this, on the one hand, by providing a systematic program of industrial mediation, to soften the struggle between capital and labor, and, on the other hand, by promoting the ideas of collective bargaining, the trade agreement, and co-operation between capital and labor. In both of these fields, the National Civic Federation played a pioneering role. In its main essentials, this labor relations program was a business men's program, for its underlying rationale was that by recognizing and cooperating with labor unions, employers could educate and encourage labor leaders to hold to a moderate course friendly to business.

In 1904, the National Civic Federation launched a program to promote employers' welfare work in American business. Welfare work, that is, organized efforts by the

employer to improve the working conditions of his employees and confer other benefits upon them, was conceived of by the Federation's business men both as a means of solving the labor problem and as a means of solving the problem of humanizing industrial society. In this field, also, the National Civic Federation was to do pioneering work, during the succeeding years.

After 1905, the National Civic Federation began to move away from its exclusive pre-occupation with the labor problem toward a concern with the issues raised by the developing progressive movement. In particular, the National Civic Federation began to turn its attention to the broad issue of government intervention in social and economic life. By 1908, a concern with this issue underlay nearly the whole of the Federation's work.

Between 1908 and 1910, the National Civic Federation rapidly developed a new program based on the attempt to solve some of the many problems raised by the issue of government intervention in social and economic life. Partly out of a fear on the part of its business members that labor was turning to radical politics, the National Civic Federation accepted the principle of workmen's compensation and began to organize to promote compensation legislation in the states. But perhaps the major share of the Federation's attention was directed toward the problems of government control of public utilities and government control of big business. To ward off the possibility of public ownership of utilities, the National Civic Federation and its business members accepted the principle of government intervention and urged that the utilities be controlled by a regulatory commission. In its attitude toward government control of big business, the National Civic Federation reflected the thought typical of the world of big business itself. Rather than control big business by government enforced destruction of big business, the National Civic Federation urged control of big business by government enforced regulation of big business.

By 1910, the main principles of this program had been worked out. The National Civic Federation was now prepared to enter into the climactic years of the progressive movement, from 1910 to 1916, equipped with a program which, fully elaborated and vigorously promoted, would provide a systematic, business men's solution to the fundamental issue of government intervention in business and

society which underlay progressivism.

416 pages. \$5.30. Mic 57-975

LOUIS AGASSIZ AND AMERICAN NATURAL SCIENCE, 1846-1873

(Publication No. 19,014)

Edward Lurie, Ph.D. Northwestern University, 1956

Louis Agassiz, a native of Switzerland, came to the United States in 1846 at the age of thirty-nine, with the intention of staying two years to pursue special studies in natural history. He had by that time an international reputation as a paleontologist and ichthyologist, and was famous for his Eiszeit or glacial theory, which remains his most profound contribution to knowledge. The welcome accorded him in the United States, the potentialities of the

new country for scientific research and progress, and his marriage to a Bostonian, Elizabeth Cabot Cary, led him to make America his permanent home where he died in 1873.

The American environment worked a subtle but decided change in Agassiz's personality so that his efforts became ever more directed toward the goals of professionalizing science and inspiring a popular appreciation for natural history, rather than toward the intensive, original researches that had characterized his European career. The opportunity to augment his research funds by offering a series of lectures at the Lowell Institute in Boston revealed a tremendous latent talent as a public speaker and popularizer of science. His success in turn led to a professorship in the newly established Lawrence Scientific School of Harvard University, and a continuing rôle as a national figure. He helped to organize the American Association for the Advancement of Science, the National Academy of Sciences, was an editor of the American Journal of Science and a Regent of the Smithsonian Institution. He was frequently consulted by the federal government in reference to explorations and research in natural history and by educators concerning the teaching of natural science.

Agassiz hoped to express his debt of gratitude to his adopted land by writing a complete study of American natural history which would offer new and useful knowledge of taxonomy for the scientist, be comprehensible and interesting to the general public, and stand as his lasting monument as a scholar. The four volumes of the Contributions to the Natural History of the United States, while recognized as a scientific work of considerable merit, were not met with unequivocal professional acclaim. As a former student of Georges Cuvier, Agassiz embraced rigid Aristotelian concepts of nature, admitting of no change or development in the organic world. He therefore became the foremost opponent of Darwinian evolution. By 1859, American naturalists had developed a confident sense of intellectual independence and criticized the obvious deficiencies in Agassiz's reasoning as offering a vehement refutation of Darwin without coming to grips with the intellectual problems posed by the concept of evolution. Moreover, his colleagues believed that the man who once promised so much for American science was diverting his intellectual energies to public activities at the expense of scholarly attainment.

From 1853 to 1859, Agassiz concentrated his attention on founding a museum at Harvard University which would illustrate his particular interpretation of natural history. The Museum of Comparative Zoology became one of the foremost institutions of its type in the world, and stands as a symbol of his endeavors in the United States. His ability to convince wealthy men and state legislators of the need for immense sums of money for the pursuit of science, the inspiration he afforded students, and his firm belief that America would one day rival Europe in scholarly achievements are all attested to in the museum he established. The meaning and importance of his career in the United States is thus to be found in his public activities for the advance of science, his educational achievements, and his mission to instruct the American people in the understanding and appreciation of natural history.

580 pages. \$7.35. Mic 57-976

THE FORMATIVE PERIOD OF AVIATION IN ILLINOIS, 1890-1919

(Publication No. 19,865)

Howard Lee Scamehorn, Ph.D. University of Illinois, 1956

The formative period of aviation in Illinois contained almost none of the distinguishing characteristics of the industry since that time. Beginning about 1890, the era of scientific experiments in heavier-than-air flight began with the work of Octave Chanute, Samuel P. Langley, Otto Lilienthal, and others in the United States and abroad. Except for the experiments of trained engineers and scientists, the majority of the flying machines constructed as late as 1910 were devoid of even the most elementary principles of aerodynamics. Chanute's experiments, though of little value because of his absorption with the problem of completely automatic stability by mechanical means, encouraged others to take up the problem. By building upon his work and others, Orville and Wilbur Wright developed a practical airplane.

Until about 1912, aviation was dominated by the amateur, whose homemade machines appeared in Chicago and other communities in great numbers. In 1910, approximately 150 Illinois residents owned, or were then building, machines of many types, including biplanes, monoplanes, helicopters, and ornithopters. In the same year, the emergence of an industry guided by professional designers, constructors, and flyers of airplanes provided a needed impulse toward standardization and stability. Within three years the amateur nearly disappeared. Thereafter, the industry developed slowly until stimulated by the production of large numbers of military aircraft.

Between 1910 and 1916, aviation suffered from an absence of public confidence, from costly litigations involving the Wrights and alleged infringers of their patent, and from the slowness of manufacturers in adopting technical improvements. To a large degree, the wartime expansion of the industry overcame these problems, making possible the development of commercial enterprises after the close of hostilities.

In the years 1909 to 1912, spectacular programs and exhibitions aroused public interest, but only pointed out the inadequacies of the airplane as a vehicle for commercial transportation. However, the Post Office Department encouraged demonstration flights to test the feasibility of airmail. In 1918, the first regular service began between Washington, D.C. and New York. A year later another route was established between New York and Chicago, and eventually extended to the West Coast. The airmail was the first commercial enterprise to utilize airplanes in large numbers.

The formative period was a transitional phase in aviation development. After 1919, air travel for business and pleasure became a reality. Effective state and federal regulation, the creation of permanent ground facilities, and increased public support were the essential missing elements prior to 1919. Had they existed earlier the modern era of aviation might have commenced during World War I rather than in the mid-1920's.

254 pages. \$3.30. Mic 57-977

HISTORY 615

IRELAND AND THE AMERICAN EMIGRATION, 1850-1900

(Publication No. 19,040)

Arnold Schrier, Ph.D. Northwestern University, 1956

In the field of immigration-emigration studies in America the emphasis has been heavily concentrated on the assimilation-acculturation process and on the contributions made by immigrants to American society. Little has been done to examine the reverse side of the coin--the impact of emigration on the country of origin. This study is an attempt partly to redress the balance and has been pursued along two major lines of inquiry: (1) an analysis of the impact on Ireland of emigration to the United States in the period 1850-1900, and (2) an analysis of American influences which filtered back to Ireland via the emigrant stream. Much new and original material has been brought to bear on the problem, including a substantial collection of emigrant letters as well as data assembled through the cooperation of the Irish Folklore Commission and interviews conducted by the writer in the south and west of Ireland.

More than eighty-five per cent of all emigration from Ireland in the half-century following the disastrous famine was directed toward American shores. The magnitude of that emigration--in proportion to total population the greatest in all western Europe--was occasioned by a peculiar set of predisposing conditions in Ireland; the fact that the bulk of it was directed toward America must be understood in terms of the "image of America" created chiefly by the inflow of millions of emigrant letters. Emigration on so vast a scale led to a vociferous albeit futile protest on the part of the newspaper press. The Irish Catholic Church, on the other hand, took no official stand on the problem.

The immediate impact of emigration was felt in two major areas of Irish life: Ireland's economy and also in a cultural-folkloristic reaction which was unique to rural Ireland. During this fifty-year period Ireland's agrarian economy underwent a revolutionary change from tillage to pasture which if not directly caused by emigration was greatly facilitated by it. American financial influences entered Ireland through the money sent back as remittances which totaled more than \$250,000,000 between 1850 and 1900. Forty per cent of this amount came in the form of prepaid passage tickets and alone paid for more than seventy-five per cent of all Irish emigration to America. The remaining sixty per cent, or "American money," arrived in small denominations and its single most important use was to pay rent. In addition, a much smaller sum was sent as contributions for the support of various political organizations.

The most remarkable cultural development was the growth of the "American wake," which in effect represented a transfer and adaptation of the Irish death ceremony—the wake—to the emigration phenomenon. The emigration theme was also reflected in a host of ballads, superstitions and expressions. Some social influences from America also entered Ireland via returning emigrants, although the number of those who actually returned was small in comparison with the four million people who left. Still, enough came back to make the "returned Yank" a familiar figure in nearly every area of Ireland. Although

most of them made no serious attempts to introduce American techniques, methods or ideas, there were qualities about the "Yanks" which distinguished them from their neighbors. Moreover their eagerness to recount the wonders of America to all who would listen added measurably to the fund of information already provided by the emigrant letters. Together they did much to familiarize the Irish with the "New Ireland" beyond the sea, and helped create the illusion that New York was but the next parish over from Galway.

279 pages. \$3.60. Mic 57-978

NOAH BROOKS, 1830-1903 (Publication No. 19,879)

Wayne Calhoun Temple, Ph.D. University of Illinois, 1956

Noah Brooks, the youngest of six surviving children of Barker and Margaret (Perkins) Brooks, was born at Castine, Maine, on October 24, 1830. His father was a master shipbuilder, but after completing school, Noah went to Boston about 1848 to study landscape painting. His interests, however, turned toward journalism, and by 1850 he was working as a reporter for the Boston Atlas and other local papers. When The Carpet-Bag was founded in 1851, he contributed sketches to it under the pseudonym of "Jacques." He also worked as a house painter and by 1852 operated a paint shop with Frederick Thomas Somerby, but it failed and Brooks moved to Dixon, Illinois, in the spring of 1854.

After borrowing money from relatives, Brooks opened another paint shop and later formed a partnership with John G. Brooks who was not a relative. They added furniture to the paint business, but their establishment failed on November 29, 1856, just a few months after Noah had married Caroline Augusta Fellows on May 29. Brooks was also an editor of the Dixon Telegraph and through this work became a close friend of Abraham Lincoln. On May 14, 1857, Brooks went to Kansas and farmed for six months before returning to Dixon.

On May 10, 1859, Brooks left Dixon for Marysville, California, where he painted signs, taught art in the Female Seminary, wrote for the San Francisco Evening Mirror as "John Riverside," and bought stock in the Marysville Appeal which he edited with Benjamin Parke Avery. After the death of his wife, on May 21, 1862, Brooks sold his interest in the Appeal and went to Washington, D. C., as war correspondent for the Sacramento Daily Union, using the name "Castine." In 1865 Lincoln chose him as private secretary, but the President was assassinated before Brooks assumed this post. Having been a clerk in the House of Representatives, Brooks had political influence and was named Naval Officer for the port of San Francisco where he moved in July of 1865. President Johnson removed him for political reasons on August 21, 1866, and Brooks was employed to edit the San Francisco Times. In June of 1867 he transferred to the Alta California as editor and the following year became assistant editor, under Bret Harte, of the Overland Monthly

The New York <u>Tribune</u> hired Brooks as night editor in May of 1871, but he quit in June of 1874 to become an editor

of the New York <u>Times</u> where he remained until June 2, 1884, at which time he became editor of the Newark (N. J.) <u>Daily Advertiser</u> and served until August 1, 1893. At this time he retired and wrote books and articles while residing at Castine and New York. He died at Pasadena, California, on August 15, 1903, and was buried at Castine.

Brooks was a member of The Century Association,
Lotos Club, and Authors Club in New York. He won fame
as an editor and was a popular author, especially in the
field of children's literature, contributing numerous articles to Scribner's Monthly, The Century Magazine, St.
Nicholas, and several other publications. His best known
works are Washington in Lincoln's Time (1895), Abraham
Lincoln and the Downfall of American Slavery (1888), and
The Boy Emigrants (1877), an adventure story for boys
which is still in print. In all he published seventeen books.

442 pages. \$5.65. Mic 57-979

THE POPULAR SCIENCE MONTHLY, 1872-1878: A STUDY IN THE DISSEMINATION OF SCIENTIFIC IDEAS IN AMERICA

(Publication No. 19,220)

Don DeVere Walker, Ph.D. University of Minnesota, 1956

The thesis makes a detailed analysis of the first ten volumes of <u>The Popular Science Monthly</u>, focusing particularly upon the major scientific ideas which the magazine helped to disseminate to American readers.

Founded and edited by Edward Livingston Youmans, the Monthly first appeared in 1872, the culmination of a broad movement to bring science to the people. For more than half a century, in the lecture hall, in the newspapers, in the magazines, both cheap and quality, science had been spreading from the specialist in the laboratory to the man in the street. Citizens of a democratic society were committed to belief in education for all men and increasingly to the assumption that science is fundamental to that education.

By 1872 Youmans has come to think of himself as a missionary of science. As lecturer, as editor of Appletons' Journal, as organizer and editor of the International Scientific Series, he had matured the plans fulfilled in the Monthly: to bring to his readers the newest and best in scientific ideas, in a form both authoritative and readable.

Three of these scientific ideas of the 19th century are extensively discussed in the thesis: the laws of energy, the development hypothesis, and the Synthetic Philosophy of Herbert Spencer.

While supported with American interest and evidence, these ideas were European in their conception. In popularizing them in America, Youmans was not only meeting an American deficiency in theoretical science, but, as he might have put it, fostering international goodwill through the universal truths of that science.

Formulated at mid-century, the energy generalizations (the doctrine of forces, as Youmans called them) had profound implications not merely for physics but for all science and that philosophy and literature influenced by science. A popular discussion of these doctrines and their implications was featured in the Monthly. Youmans' friend, John Tyndall, the British physicist and author of Heat as a Mode of Motion, was the leader in this discussion, with Balfour Stewart, Maxwell, and others making major contributions.

At the founding of the <u>Monthly</u>, the development hypothesis still stirred up a vigorous debate. New evidence to support or refute Darwin, further application of Darwinism to politics and society, implications for religious belief, these were presented the readers of the <u>Monthly</u>. Another of Youmans' friends, Thomas Henry Huxley, along with Wallace, Mivart, and other leaders of evolutionary science, supplied the text of discussion.

The most dominant idea of all, however, was the Evolutionary Philosophy of Herbert Spencer. A need for a serial outlet for The Study of Sociology prompted the establishing of the Monthly, and during the five years Spencer contributed more than thirty articles. Youmans became known as Spencer's American spokesman, and in some justice the Monthly could be called the Evolution Monthly.

350 pages. \$4.50. Mic 57-980

HOME ECONOMICS

PRACTICES AND ATTITUDES OF HOMEMAKERS IN CLEANING THE LIVING ROOM

(Publication No. 20,427)

Irene Emilie Witzke Roberts, Ph.D. Cornell University, 1956

The principal objectives of the study were to describe the last general cleaning of the living room and to examine certain variables thought to be related to the amount of cleaning performed. Cleaning as a task was selected for study since it is little mechanized and practically no commercial means of performing it exists.

An interview schedule was obtained in the fall of 1954 from 127 homemakers in the New York Springdale project, an area used in a study on social growth by the Department of Child Development and Family Relationships of New York State College of Home Economics. Each homemaker had her husband living at home, had at least one child five years old or more, and had participated in the last cleaning of the living room.

Time spent in cleaning, number and kind of cleaning operations, trips made from the living room, and furnishings handled were measures of the amount of work homemakers performed in cleaning the living room.

The greater the use of the living room, the greater the number of furnishings. Small but consistent differences indicated that homemakers in families with a high rather than low use of the living room performed more work.

Few homemakers used help but those doing so performed less work. The main contribution from helpers was in straightening the room, dusting and handling of furnishings. Homemakers in the upper socio-economic group rather than in the lower used help although only two hired help.

On the average homemakers spent an hour a week in cleaning the living room, performed five cleaning operations, and made eight trips from the room. Most of these trips were to remove an item or to get supplies and equipment but in over one-third of them homemakers either went out or returned empty-handed. Two-thirds of the furnishings were handled, and floor furniture was handled more than any other type. Most homemakers combined the practice of moving each piece of furniture individually as approached with moving pieces in units.

In all households the floor and furnishings received some type of cleaning from the homemaker or her helper. Walls received no attention in almost one-half of the households. The greater the amount of furnishings, the greater the number handled and dusted, the greater the number of pieces of equipment used, and the greater the number of vacuum cleaning operations performed.

Families without a full-sized rug and with a heating stove in the living room did not use a vacuum cleaner extensively but used supplies and water for cleaning. A relatively large number of them lived on farms and in rural non-farm areas, were in the lower socio-economic group, and had many children.

The use of supplies, water for cleaning, and many pieces of equipment increased the amount of time spent in cleaning, the number of cleaning operations and trips from the room, and the amount of furnishings handled. Convenient storage for supplies and equipment appeared to be lacking and unplanned.

About one-fourth of the homemakers had a favorable attitude toward cleaning, and almost one-third, an unfavorable one. The former performed consistently more work than the latter, significant differences noted as follows: performance of a greater number of cleaning operations, use of a greater number of supplies and pieces of equipment, more trips from the living room, and more floor furniture handled.

The study indicated a need for homemakers to develop plans for cleaning, improve their selection and use of vacuum cleaners and attachments, and plan storage for supplies and equipment. The possibilities of training children in homemaking through increased use as helpers are worth further study.

280 pages. \$3.60. Mic 57-981

JOURNALISM

JOURNALISM EDUCATION AND THE SOCIAL
SCIENCES: AN ANALYSIS OF RECENT EDUCATIONAL
THOUGHT REGARDING SOCIAL STUDIES
INSTRUCTION FOR STUDENTS IN SCHOOLS AND
DEPARTMENTS OF JOURNALISM IN
THE UNITED STATES

(Publication No. 19,993)

Russell Jerome Jandoli, Ph.D. New York University, 1956

Problem. The thesis problem was to describe and analyze the views of journalism educators concerning the nature and extent of social studies education for those training for journalistic careers in American colleges and universities and to determine the extent to which these views are currently implemented. Though the social sciences have been a predominant factor in collegiate education for journalism from the beginning, there has not been an orderly display or correlation of educational thought on the matter. Without such a synthesis, journalism education finds it difficult to fix standards and procedures regarding the specific nature of social science training for journalism students and to support fully its claim to academic status.

Background of the Problem. Although scholarly articles have treated elements of the problem, no integrated study has been made. Increased attention has been directed to the problem by the curricula studies of Nash (1928), Sutton (1942), Ford (1948), et al., along with heightened interest in integration of the social sciences with journalism starting in the 1920s and the rise of interpretative journalism in the thirties and of communicative arts in the forties.

Data. All available pertinent literature on journalism education and on related social science subjects was examined. This chiefly involved the contents of scholarly journals and periodicals, particularly Journalism Bulletin, Journalism Quarterly, and Editor and Publisher, whose files were consulted in their entirety; doctoral and masters' theses; college and university catalogues; interviews and correspondence with educators; scholarly papers and speeches; newspaper files and an opinion survey.

Methods and Results. The expressed thought was cited under several pivotal questions posed; the yield was summarized in part and in whole and an analysis made. This permitted the formulation of special aims for social science instruction for journalism students and provided evidence indicating that (1) in substance, journalism education was always allied to social studies rather than to English and its technical phases held supplementary to fundamental liberal arts training; (2) practitioners and educators both uphold social science training for journalism students; (3) journalism students can and often do study social sciences in depth; (4) economics is tending to replace political science as the preferred social science for journalism students; (5) four-year programming in social science is recommended; (6) journalism teachers are often learned in social science, and (7) integration of social science with journalism can and does work in practice.

Generalizations. The research clearly indicates that journalism educators have become increasingly cognizant that journalism's intellectual content lies primarily in the social sciences, that journalism education's chief role is to integrate, and that the overarching purpose of social studies for journalism students is to increase awareness of journalism's predominant task of exercising social responsibility in human affairs.

Applications. The research should afford educators a clearer notion of the purposes of social studies training for journalism students. In many instances, it might well lead them to a reappraisal of their own programs and practices.

The conclusions and implications presented may guide educators in setting up requirements in the social sciences and should aid considerably in counseling students. They may also help administrators in screening prospective staff members, as well as students.

Indeed, the research might clear the way to journalism's intellectual resting place by offering proposals for integrating the social sciences with journalism and by rendering meaningful the expressed thought.

302 pages. \$3.90. Mic 57-982

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

POPULAR LITERATURE AND SOCIAL PROTEST, 1485-1558

(Publication No. 17,433)

Francis Edward Abernethy, Ph.D. Louisiana State University, 1956

Supervisor: Professor Waldo F. McNeir

The changes in the character of the English nation under the rule of the pre-Elizabethan Tudors were accompanied by an increased awareness of social and political problems on the part of the people of the realm. This new social consciousness was reflected in contemporary popular literature. Through a study of that literature, an attempt will be made to discover and understand the national reaction to the changing statescape and to evaluate the place of such literature under the early Tudors.

Tudor England before 1558 was troubled with four major social issues: the Reformation and the dissolution of the monasteries, the agrarian revolution and its accompanying evils - enclosure and dispossession of the tenantry, increased sheep farming, and increased rents and fines - debasement of the coinage and inflation, and the problem of the poor. These same social issues, or their consequences, remained to trouble the Elizabethans; but the voices of social protest were not so vociferous in the latter half of the sixteenth century. Popular literature from 1485 to 1558, both reflecting public opinion and attempting to mould it, attacked all four of these major social problems, usually taking the conservative position and resisting the fundamental changes which were taking place in the functions and patterns of society. Much of what was written merely condemned existing conditions; some writers suggested remedies for the existing evils; and all of them acted as forces in different degrees influencing and reflecting the temper of the times.

The progress of popular protest literature during the period 1485-1558 was dependent upon the development and improvement of printing and the leniency of the reigning sovereign. It took some time before Tudor printers were able or ready to undertake the publication of ballads and tracts, but by the 1520's popular literature was growing in importance, and its influence was brought to bear on the major social problems. There was a spurt of popular literary activity at the outset of the English Reformation around 1530 which lasted through the dissolution proceedings. Possibly Henry relaxed censorship in order to allow anti-Catholic literature to win him supporters in the supremacy question. Much of that literature which was circulated in the pre-Edwardian 1540's was against Catholicism or the remains of Catholicism in the Henrician established church and was usually anonymous and cast in the form of supplications. The state of the poor and the agrarian revolution were receiving more and more attention during the 1540's. Protest writing reached a climax

during Edward's reign, accelerated by inflation, rioting vagabonds, an increasing number of agrarian dispossessed, and an established church which had failed to fulfill the expectations of most active reformers. Medieval customs, price levels, and beliefs which had been slowly vanishing during the first fifty years of the century were now rapidly disappearing; and the social commentators, the spokesmen for the people, became frantic in their search for something of value to take the place of lost ideals, for something stable to hold on to, and for a solution to the glaring social evils of the day. The stability which they thought would be enjoyed when Mary ascended the throne soon proved to be negative; and because of her severe censorship of the press, the Marian reign became the Dark Ages for sixteenth century popular literature, little remaining to mark the train of popular discontent. Most of the major social problems were settled to some degree during Elizabeth's reign, and crown restrictions on printing were relaxed. Social problems still existed, of course, and protest literature throughout the century continued in its role as popular spokesman for the English middle class.

226 pages. \$2.95. Mic 57-983

THE TREATMENT OF AMERICAN HISTORY IN THE AMERICAN NOVEL 1890-1910

(Publication No. 19,734)

Essie Beatrice Batson, Ph.D. George Peabody College for Teachers, 1956

Major Professor: Susan B. Riley

The purpose of this study was to determine the American historical materials used by the novelists of 1890-1910 and to analyze to some extent how the novelists used the materials. One hundred and thirty novels were examined.

In order to define and illuminate the genre as a whole, Chapter I is concerned with the function of the historical novel as a literary type and a survey of its development in America up to 1890. Novels for the main study are arranged by historical backgrounds. Chapter II is concerned with the novels of the Colonial Era, Chapter III with those of the American Revolution and its aftermath, Chapter IV with the Westward Movement, and Chapter V with novels that treated Pre-Civil War issues prior to the outbreak of the War. Within each chronological period, the arrangement follows a topical sequence, novels on a given topic being discussed usually in the order of their publication. Following the treatment of the historical novels, there is a final chapter devoted to conclusions drawn from the study. An Appendix gives a listing and brief description of all historical novels used arranged according to the historical backgrounds to which they belong.

Findings of the Study

Historical novels interpreted many phases of national history. They depicted the settling in America of a new people and their problems in possessing the continent, the struggle with the Mother Country for independence, the onward movement to Western frontiers, and the issues which led to the outbreak of conflict between the North and the South.

The greatest appeal to the novelists was the period of the American Revolution and its aftermath. Forty-three novelists in fifty-eight novels examined such popular themes as the background of the conflict with the Mother Country, the signing of great documents, familiar battles on land and sea, attitudes toward the War of political leaders, soldiers and non-combatants, the effect of the War on the private citizen, and the attempts of an independent America to establish her own national government.

The study evidenced that there was a rising interest in the historical novel in the early and middle nineties with the peak reached during the closing years of the nineteenth and the opening years of the twentieth centuries. Of the twenty-year span which the study covered, the years, 1897-1902, produced more than half of all the novels examined. These fecund years saw an active flow of highly romantic novels, but by around 1905 this particular surge of interest in the historical novel was over and there was evidence of some progress toward a more realistic treatment of materials.

Distinctions in the method of handling historical materials appeared. The most prevailing pattern was using history simply as a backdrop for romance. Other novelists used it to portray reactions of men to historical events, to sum up the traditions of an age, to support preconceived ideas concerning an idealized hero, and to pay tribute to those who died for American triumphs.

In spite of the artistic deficiences of many of the novels, they are specific examples of a literary impulse that suddenly rediscovered a picturesque American past. By making history real to its readers, and by showing what history meant to those who were caught in the currents of its moving events, historical novels of 1890-1910 have vivified our sense of the past.

250 pages. \$3.25. Mic 57-984

THE LIFE AND WORKS OF WILLIAM ALABASTER, 1568-1640

(Publication No. 20,230)

Eleanor Jean Coutts, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Helen C. White

This study of William Alabaster's life and works was undertaken to discover why he had such a considerable reputation among his contemporaries, as "the rarest poet and Grecian any one Age or Nation produced," and yet, after the seventeenth century, could arouse only a "rare" flash of antiquarian interest. We have investigated contemporary manuscripts and other historical records for biographical material, to fill out the mere outline found in

biographical dictionaries, - Alabaster's only record in the years since then. We have studied his manuscript Latin poetry, and have made translations of large portions of the Latin theological treatises which were printed.

The riddle of Alabaster the man has not been completely solved, for so many of the occasions which gained him a certain notice were almost accidental. He had leaped to fame at Cambridge with the production of his Latin play, Roxana, the performance of which apparently caused a sensation. "Alabaster, throughly taught," as Spenser acclaims him, was on the outskirts of Elizabeth's court, until he gained even more attention, from both sides, by his conversion to the Roman Catholic Church, and went off to Rome, and, for a short time, to the English College there. He was soon back in England and in prison for a longer period, but he was not out of the limelight, because of his connections with the Earl of Essex. A few years later, after Alabaster had stormed the court of the Inquisition with his discovery of a new method of interpreting Scripture, he returned, via at least two prisons more, to England and the Anglican Church. Here he gained recognition from James I as a learned Doctor, as well as an audience for his ideas about the reconciliation of the two Churches. Then Alabaster retired to his studies, and the prison of his imagination, which was rather well stocked with "Rabbinical" fancies. He only came forth in 1633, with his clarion proclamation, Ecce Sponsus Venit, on three Trumpets: - the End of Time and the Last Judgment - although this was to be, first of all, an intellectual and spiritual event. Then silence again, until his death on an "April Day" in 1640, not far from his earlier prison, the Tower of London.

Alabaster's reputation as a classicist is perhaps easiest to justify; there are many Latin epigrams, and longer poems as well, in manuscript collections of the seventeenth century, and we know that he wrote such occasional poetry throughout his life. This Latin poetry may be an index to Alabaster's personal attractiveness to those around him, for which there is so little direct evidence. Only their language, perhaps, kept these poems from a more lasting fame.

The autobiography in Alabaster's writings is all "prophetic," and therefore it is writ large, in the Rasche Theboth, the capital letters, of his Cabalistic method. All his linguistic studies of the Bible, – and Alabaster spent endless time (some thirty-odd years of his life) and effort on his work – resulted in Latin treatises which are fascinating when they are not incomprehensible, but which have no great value in scriptural interpretation.

Alabaster believed that he understood the workings of the Holy Spirit in Scripture, and in men's hearts, as God revealing Himself to man, but he became more concerned about the method of revelation he himself had come upon than the message the prophet ought to bring.

However, Alabaster's English sonnets have survived even better than his reputation (which is securely if prosaically recorded in the Dictionary of National Biography). These poems, composed chiefly at the time of his conversion, remain in manuscript for the most part, but several have come to life in anthologies of Elizabethan poetry. They show that Alabaster takes his place with those other Elizabethans who wrote some good poems, but whose main business was not poetry. 549 pages. \$7.00. Mic 57-985

THE JUDGMENT DENOUEMENT OF ENGLISH RENAISSANCE COMEDY FROM 1553 TO 1625

(Publication No. 20,031)

James William Culp, Ph.D. Vanderbilt University, 1956

Supervisor: Professor Joseph Allen Bryant, Jr.

The purpose of this study is to tell the story of the significant stages in the development of the judgment type of denouement which first made its appearance in formal English comedy in Gammer Gurton's Needle in 1553 and continued to develop as a dramatic technique until the end of the Jacobean period in 1625. The judgment denouement is defined as a plot device in which the action of a comedy is completed by the use of a judgment scene in which some person of authority appears to mete out rewards and punishment to those who have been involved in a conflict of right and wrong. The judgment denouement as used in English Renaissance comedy is Christian, having developed in the native English religious drama of the thirteenth and fourteenth centuries with its dual emphasis on Christian morality and Christian eschatology. But the method of the judgment denouement in sixteenth-century English comedy is influenced by the denouement of Roman comedy, in which the solution is brought about by the fortuitous entrance of a persona ex machina who has the right information for a happy ending.

The English comedies are considered in three groups. In the first group, the comedies from Gammer Gurton's Needle (1553) to those of John Marston are considered. The study shows that in the earlier comedies the conflicts are fortuitously resolved just as in Roman comedy by means of introducing a persona ex machina to make the appropriate discovery and to pronounce the judgment. By the turn of the century the popular method of disguise and sudden discovery of the disguised person is used to provide the judge of the solution; but the judgment is still fortuitous in that the sudden discovery and the appearance of the judge are unexpected, and the judgment which follows seems only slightly related to the previous action. The second group of comedies treated are those of Thomas Middleton, who completes the development of the fortuitous judgment denouement. Middleton's judgments are sudden and unexpected; but they are also Christian in that the good are rewarded and the bad punished or forgiven upon their showing signs of moral restitution.

The third group of comedies are those of Ben Jonson, whose judgment denouements like those of medieval drama are an integral part of the action of the play in that they are expected from the many references to a judgment or the coming of one of authority in the action preceding the final judgment scene and from the nature and actions of the characters themselves. Actually, however, Jonson's judgment denouements grow out of the actions of the characters and bring about a logical solution of the type called for by Aristotle and the critics who derived their theories from him.

The study also shows that the quality of mercy and its part in tempering justice becomes important in the solution of the Moralities and remains of some importance in the solutions of English comedy save those of Ben Jonson. There is little or no emphasis on mercy in Jonson's

judgment denouements. The decisions of the judges in all the comedies are usually made not on the principle of cold right or wrong, but on the basis of the offender's showing some sign of a moral regeneration by a confession or an act of contrition, and upon the judge's desire and willingness to show mercy.

The judgment denouement, either formal or informal, gives dignity and seriousness to the comedy and strengthens the moral tone of the play.

381 pages. \$4.90. Mic 57-986

DEATH: IDEA AND IMAGE IN SOME LATER VICTORIAN LYRISTS

(Publication No. 16,933)

Miriam Ernestine Fackler, Ph.D. University of Colorado, 1955

Supervisor: Professor Leslie L. Lewis

The poetic treatment of death as an area of study in which to observe the impact of rationalism on the work of the Victorian poet, has been, for the most part, neglected. This thesis, accordingly, isolates and focuses attention upon the concept of death and its artistic treatment by certain lyrical poets of the middle and later years of the Victorian era in order to display the distinctive character of each of the several presentations of death, and, more specifically, to show how rationalism affected such presentations.

Three major points of view current in the period – evangelical, Roman Catholic, and materialistic or rationalistic – are here represented by Christina Rossetti, Francis Thompson, and Thomas Hardy, all much preoccupied with the thought of death and all accomplished lyrists.

Analysis of the work of these three writers shows that each poet answers questions regarding the nature of death, its place in the cosmic scheme, and its effect on man, in accordance with his personality and Weltanschauung, expresses corresponding moods and attitudes in the face of death, and employs death imagery in marked harmony with his world and life view.

This study indicates that Christina Rossetti's poetry related to the theme of death is scarcely touched by rationalism, being thoroughly evangelical in concepts. It is not morbid, as has been affirmed, but trustful, forward-looking, even cheerful on occasion, warmly human, deeply devoted. The death imagery is traditional, conventional, drawn in large part from the pleasing aspects of nature and from the Bible, but so colored by the poet's spirit as to be refined, charming, distinctly personalized.

Thompson shared the rationalist's scientific understanding of the dissolution of the body, with the attendant recoil and pity, but also the Christian's faith in the spiritual significance of the cosmos and the immortality of the soul, with accompanying trust and, frequently, the mystic's exaltation of spirit. His death imagery, highly individual, drawn from diverse sources – books read, personal experiences, nature, science, the Bible, the ceremonies of his Church – is heightened, often, to superlative proportions by religious ecstasy and the power of his extraordinary imagination. When Thompson's imagery is

concerned with physical death, it reflects the influence of science.

Hardy, rejecting orthodox Christianity and taking his stand on a materialistic interpretation of the universe, squarely based on the evolutionary hypothesis, makes a strong attempt, in his poetry of death, to maintain a naturalistic attitude. With supernaturalism he will have nothing to do. Intellectually he abandons all faith in immortality. Impatient with the optimism of his age, he opposes to the brighter views of life and death his own "full look at the Worst." Yet, when his loved ones die, his strain of transcendentalism sets him imagining they are still near, and yearning for the assurances of the Christian.

Hardy pictures death, objectively, realistically, scientifically, as the natural culmination of life in dissolution. Accordingly, his Death, as compared with that of the earlier Victorians, is greatly reduced in stature, dignity, awesomeness; and his emotion, in face of it, is neutral or low-keyed.

The poet's figures and images, drawn from homely, commonplace scenes and actions – usually of the grim, wry and ironic sorts – transformed by Hardy's genius, become singularly arresting, illuminating, fresh, apt.

It seems just to conclude that if the rationalist as man gained nothing "by subtle thought on things," as Hardy once said, the rationalist as poet gained markedly in qualities much admired by the twentieth century.

206 pages. \$2.70. Mic 57-987

SYMBOLIC PRESENTATION OF IDEAS IN CARLYLE

(Publication No. 19,112)

John Monson Lindberg, Ph.D. The University of Wisconsin, 1956

Supervisor: Assistant Professor Alvin Whitley

Because his ideas are so controversial and at the same time so representative of his era, Carlyle's artistry has been ignored, yet it would be just as partial to concentrate on his technique alone as it has been to divorce his ideas from their context. I set myself to discover the relation between artistry and idea through symbolism.

The imagination is the symbol-building faculty, and the motive of the imagination is a faith in the significant order of the world. The imagination deals with sensory images of direct experiences, and the images fall into a configuration meaningful to the artist's perception of order in the cosmos. When the configuration is a simple intellectual comparison, the comparison is a metaphor, but when the configuration illustrates an intuitive sense of harmony uniting vast realms of experience, the intuition is a symbol. Consequently, aesthetic theories rationalize intuitive faith, and a symbol is an index to moral assumptions.

Carlyle's career may be divided into three periods, each characterized by a different aspect of his symbolic world. I have called these periods The Growth of Satire. The Uses of History, and The Emergence of Prophecy. Uniting these periods is the transcendental view of a universe containing boundless evil, boundless good in

ceaseless conflict through the illusory forms of Time and Space. Playing through this dualistic cosmos is a principle of satiric double-vision always ironically aware of the limitations of men faced with a divine task.

Sartor Resartus is the first full employment of the satiric vision and is the principal work in the first period. It is a hoax and burlesque of Carlyle's beliefs. This humorous irony is meant to disguise a serious prophetic mission. Sartor is a satiric mask delivering Carlyle from the skeptical perplexities of his early years and starting him on his artistic career.

The French Revolution represents the full formation of the history-symbol. It is not a mask because there is no distinction between the philosophic symbols of the transcendental world-view and the literary symbols employed to shape the facts of the historic events. Consequently, The French Revolution is a full cooperation between philosophy and art, so that Carlyle's personal faith is embodied unobtrusively in the symbolic structure of the book.

The falling off after the history was neither so sudden nor so complete as many critics think. There is still a distinct interpenetration of reality and symbolic theme in Heroes and Hero-Worship and Past and Present, and although there is no one symbol governing the use of material in Latter-Day Pamphlets, this book repeats the symbolic devices of Carlyle's earlier works. Despite the repetition and the emphasis on unpleasant images, the general symbols of the last period maintain the transcendental dualism. There is a strong constructive faith balancing the seeming despair of the prophetic mask.

Sartor Resartus obscured the growth of prophetic reservations about life behind the hoaxing framework. The French Revolution offered Carlyle the opportunity of indulging both his creative talents and his less complex religious faith, since each of the multiform phases of the Revolution could be directed toward a personal vision of apocalypse. In the last period, art was abandoned altogether in favor of prophetic symbols having little connection with reality. Nevertheless, the inextricable involvement between satiric double-vision and transcendental religion achieves valid symbolic insights even in Latter-Day Pamphlets. The prescriptive prejudices of Carlyle's whole career arranged his material into symbols of an orderly, hierarchical society which give a special relevance to even his most offensive images.

595 pages. \$7.55. Mic 57-988

ECONOMICS AND ETHICS IN ENGLISH NOVELS BETWEEN 1719 AND 1771

(Publication No. 19,757)

Robert Nelson Paine, Ph.D. George Peabody College for Teachers, 1956

Major Professor: William J. Griffin

The purpose of this study is to assess the influence of middle-class economic values upon concepts of morality set forth in English novels of the mid-eighteenth century. To determine this influence an analysis was made not only of English novels between 1719 and 1771, but also of historical documents, philosophical tracts, and social and

intellectual histories. In addition, biographical and critical data concerning novelists and the growth of the English novel were examined.

Findings of the Study

During the last years of the seventeenth century, the middle class, which for generations had been increasing both in size and importance, achieved a position of dominance in English society. With the rise of the middle class, patterns of culture tended to reflect bourgeois ideals and interests. In both ethics and literature the influence was particularly marked. The bourgeoisie had raised itself through trade and commerce. Money was the key to its success. The acquisitive pursuit was elevated in the middle-class code as a primary function and duty of man. Material success was seen as an evidence of spiritual salvation. The ethics of business came to dominate the moral code, and industry, thrift, and prudence were regarded as among the chief virtues.

The middle class, through its philosophers, devised theories of property ownership to justify its acquisitiveness. The most famous of these theories was that prepared by John Locke. Locke's idea of property ownership postulated that every man has a natural right to property in his ability to work. As it was interpreted in the eighteenth century, Locke's theory gave prominence to the moral qualities of industry, thrift, and shrewdness – the same qualities elevated in the acquisitive ethic.

In the novels of mid-eighteenth century England, the influence of the acquisitive ethic is also seen. It is revealed most forcibly in the general concern with property and wealth and in the approbation which surrounds the acquisitive pursuit.

Another fictional representation of the influence of economics on ethics is found in the conceptions of virtue and vice. Among the chief attributes of virtue in the novels are industry, thrift, and prudence. The novelists reward these qualities with the possession of property. In many instances, characters are good in order to be rewarded; they bargain for reward. Characters who are depicted as lacking in virtue are frequently prodigal and indolent. Such individuals are generally punished by deprivation of property.

A final example of acquisitive morality in the novels is the depiction of those characters who are refugees from the middle class. These characters are either under- or over-acquisitive and as such they are not full members of the middle class. Refugees are sometimes depicted as being punished, as is Jonathan Wild, but more frequently they are portrayed as not enjoying full membership in middle-class society, like Dr. Harrison in Amelia or Sir Launcelot Greaves.

In English novels between 1719 and 1771, the concepts of morality which are expressed manifest the strong imprint of the acquisitive ethic. Like Locke, the novelists are apologists for the acquisitive pursuit and they uphold the idea that the right to property is conferred by labor, thrift, and prudence. That both the fiction and the philosophical arguments reflect middle-class acquisitiveness is an indication of the important place which it held in bourgeois life. It also suggests that the mid-eighteenth century novels portrayed the life and thought of the time with considerable fidelity.

277 pages. \$3.60. Mic 57-989

HAWTHORNE'S HANDLING OF POINT OF VIEW IN HIS TALES AND SKETCHES

(Publication No. 20,264)

Thomas Francis Walsh, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Harry Hayden Clark

The purpose of this study is to examine Hawthorne's handling of point of view in his short fiction and to show that an awareness of his narrative techniques leads to a clearer understanding of the organic forms and total meaning of these works. Point of view is defined as the mind through which the narrative is presented.

The first person point of view Hawthorne reserves for most of his sketches and a few of his tales. These works have received little critical attention, but a study of the reflective and detached observer of "Sights from a Steeple," of the introspective narrator of "Monsieur du Miroir," who plunges into the dangerous depths of his own soul, and the naive, Gulliver-like character in "Earth's Holocaust," whose gullible approval of reform movements is the ironic measure of their evil, clearly shows Hawthorne's artistic versatility in the handling of this point of view.

The third person point of view Hawthorne reserves for most of his tales proper, in all of which pieces the author intrudes his own personality. In many passages he is clearly omniscient, telling the reader about his characters and analyzing their minds. Many other passages contain generalizations of a philosophical and psychological nature, his later tales containing more such passages than his earlier ones. However, when he does choose to sift the action through the mind of his characters, he is more successful in a later tale, such as "Rappaccini's Daughter," than in an early tale, such as "The Gentle Boy."

One must conclude from a study of Hawthorne's third person tales that the author never fully appreciated the artistic problem of consistent handling of point of view. This conclusion is also borne out by a study of his novels. The more complex his later tales and novels become with respect to his thematic material and the number of fully developed characters, the more unsolvable the artistic problem becomes. However, it is a grave mistake to dismiss Hawthorne, the artist, as several modern theorists on the short story have done. Careful study of Hawthorne's handling of point of view will forestall many misinterpretations of meaning and form in his short works. Awareness of point of view in "Young Goodman Brown" and "The Minister's Black Veil," for instance, will help prevent the reader from confusing the characters' views on the nature of man with those of the author. He will realize that Georgiana in "The Birthmark," from whose point of view most of the action is presented, is much more than a mere object of an experiment, as many consider her, and that Giovanni, and not Rappaccini or Beatrice, is the main character in "Rappaccini's Daughter." He will also not criticize "Wakefield" as a poorly constructed tale, but will realize that the story of Wakefield serves as an illustration for the author's speculations on how one action can determine a man's whole life. 557 pages. \$7.10. Mic 57-990

LANGUAGE AND LITERATURE, CLASSICAL

PROLEGOMENA TO HERODIAN; TRANSLATION AND TEXTUAL COMMENTARY TO BOOKS II. 9. I - III. 15. 8

(Publication No. 20,108)

Reynold Lawrence Burrows, Ph.D. Princeton University, 1956

Although many of the separate facts related by Herodian have been investigated by historians, the writer himself has rarely been the subject of investigation. The dissertation consists of a prolegomena to Herodian, and a translation and commentary to sections II. 9. 1 — III. 15.8. Under Prolegomena are included Textual History (MSS., Editions, Translations), and analyses of various aspects of Herodian: the Man (Origin, Official Status), the Author (Style of Composition, Diction, Literary Technique), the Historian (Historical Criteria, Philosophy of History, Influence, Evaluation).

From a consideration of Herodian's own remarks and of the terminology that he uses, his origin is probably eastern, the evidence cited by previous writers for specifically Alexandrian or Antiochene origin being tenuous. Aided by certain on-the-spot observers, he began writing, probably from his early youth, sketch accounts of the reigns of the emperors. He filled in and polished (at later times) mainly from memory the details of information pertinent to the various reigns. It is possible that Herodian wrote the events of seventy years which would take his account to the end of the reign of Decius (251 A.D.) and that the events of the reigns of Philip and Decius could have been included in a ninth book (following the example of Herodotus).

Herodian is acquainted with the work of other writers; but it seems he suspected either the flattering unreliability of their histories or, if they were reliable in his opinion, the applicability of their material to his literary purpose. It may be further deduced that Herodian was little influenced by them but preferred to rely on his own experience or on what he considered responsible eyewitness' accounts.

Herodian cannot be accurately termed a historian, for he displays no analytical power or philosophical insight, and consequently he evinces no grasp of any causal significance in the concatenation of the events with which he deals. In many respects one may consider Herodian a biographer, since he is interested in the individual lives of the emperors and not in the periods in which they lived.

Herodian seems to limit himself to those most important events which are dramatic, exciting, and admit of rhetorical embellishment, such as plots (Plautianus) revolts (Niger, Albinus), feuds (Caracalla, Geta), indeed, events in which grand passions are exhibited. Facts (such as Caracalla's gift of citizenship) and practical considerations (such as laws, government, treaties, agricultural conditions, appropriations, buildings, societal conflicts, etc.) are simply omitted.

In the criticism of the text usually points involving some historical significance are treated, and, in the majority of these cases, all variants are cited. In my opinion, the chief editors, Mendelssohn and Stavenhagen, are often prone to reject MS authority instead of employing some imagination in dealing with the text.

122 pages. \$2.00. Mic 57-991

LANGUAGE AND LITERATURE, LINGUISTICS

LINGUISTIC ANALYSIS OF ST. PAUL'S
EPISTLE TO THE ROMANS AND
PROLOGUES TO THE EPISTLES IN
MS. I. 1. 2 OF THE LIBRARY
OF THE ESCORIAL

(Publication No. 20,226)

Anita Delores Brown, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Lloyd Kasten

The subject of this thesis is a study of the sources and language of the Prologues to the Epistles and the Epistle to the Romans of St. Paul in Ms. I. 1. 2 of the Library of the Escorial. The sections are: Introduction, Text, Syntactic Analysis, and Vocabulary. The study was made with the use of photostats of the text.

Ms. I. 1.2, which contains the Biblical portions of Parts IV and V of the General Estoria of Alfonso el Sabio, seems to be a translation of the Latin Vulgate. It belongs to the family of translations made in the Iberian Peninsula. Significant variants reveal a strong resemblance to an eighth century Latin text, the Codex Toletanus.

Introductory items consist of a list of the Epistles, a list of saints, 48 proofs and testimonies, summaries of the chapters in Romans, the first prologue of St. Jerome, argumento of St. Jerome, and the reasons for St. Paul's writing to the Romans. Latin models for three of the seven sections have been found. The text of the argumento and prologue are based on an Argumentum by Pelagius and on a Prologus attributed to him. Similar in content are the Argumentum Marcioniticum and the argumento directly preceding Romans. No prototype was found for the other parts nor for la glosa cited as reference in verses 5:14, 5:15, 8:15.

Closely related to I. 1.2 is Escorial Ms. I. 1.6. The archaic and popular language of I. 1.6 constitutes the principal difference between them.

Of linguistic note are the following: there are two examples of lo as a masculine personal direct object. Le and -l are the forms generally used. There is one example of los as indirect object. Njnguno is used solely for persons. Nos, uos, vos are the forms used for subjects, direct and indirect objects, objects of prepositions, and as reflexive pronouns. Special forms with prepositions are comigo, conuosco, conuusco, consigo, entressi, and assi. There are six examples of the subject and four examples of non interpolated after an object pronoun before the verb in a subordinate clause. The pronoun precedes the whole form of a compound tense in 12 instances and follows the first element in five cases. There are no cases of the pronoun following the compound tense.

The three examples of the demonstrative adjective ese all refer to a second person. Aqueste is found four times. The 14 occurrences of aquel refer both to second and third persons. The stressed form of the possessive adjective, mjo, is found preceding the noun. Both it and the unstressed mj are used with and without a preceding definite article. Tu and su are the second and third person forms in the text. There are two cases of a split future.

Mente, mjent, and mjentre are found as adverbial elements.

In the imperfect tense, there are two cases of -ia as a first person singular verb, 12 cases of -ia as third. All examples of -ie are third person.

The conditional tense occurs 12 times in the text. The -ra form is used as a pluperfect indicative consistently.

Auer is the auxiliary verb which forms the perfect tenses.

There are no clear-cut cases of <u>seer</u> and the past participle as a perfect active tense.

The infinitive is used as an affirmative command in ten instances, as a negative in three.

There is a single example of <u>por</u> used as a subordinate conjunctive adverb of purpose.

380 pages. \$4.85. Mic 57-992

LANGUAGE AND LITERATURE, MODERN

THE THEATRE-ROYAL IN DRURY LANE, 1711-1716, UNDER COLLEY CIBBER, BARTON BOOTH, AND ROBERT WILKS

(Publication No. 20,099)

Leonard R. N. Ashley, Ph.D. Princeton University, 1956

The investigation began with the examination of two scrapbooks (once the property of James Orchard Halliwell-Phillipps) now in the Folger Shakespeare Library and brought to the attention of the author of the present study by Professor Alan S. Downer of Princeton. These papers are theatrical bills and accounts signed by Colley Cibber, Barton Booth, and Robert Wilks as co-managers of The Theatre-Royal in Drury Lane around 1711 to 1716. One scrapbook contains 357 miscellaneous bills and the other 72 bills segregated because they make specific mention of productions of Shakespeare's plays (or adaptations).

An extensive search uncovered more such bills and accounts. The uncatalogued papers of The Folger Library yielded some and so did The British Museum, The Garrick Club (London), The Widener Room Collection and The Theatre Collection at Harvard University, The Gabrielle Enthoven Collection at The Victoria and Albert Museum, The Henry E. Huntington Library, The Pierpont Morgan Library (New York City), and The Berg Collection in The New York Public Library. In all 514 manuscripts were brought together, including 17 items related to this management, but not similar to the rest, which are appended as "Other Documents."

On the basis of these papers this study has constructed a picture of the management of The Theatre-Royal in Drury Lane for the period they cover.

The "Prologue" explains the provenance of these papers and quotes a document now in The Public Record Office which seems to explain their origin. The managers of the company agreed to keep records of all expenditures, to have all bills for a pound or more countersigned by all three, and to meet at least weekly to examine the accounts.

Two sections follow which help the reader to understand the general background of the manuscripts: brief sketches of the lives of the three managers ("Dramatis

Personae") and "A Brief History of the Management of The Theatre-Royal" in the period.

The manuscripts give proof of certain actors in particular plays (backing up the evidence in John Genest's Some Account of the English Stage, 1832, and the scattered playbills which survive) and provide us with a picture of the company. The three actor-managers ruled a fairly large stock company (nearly forty actors, about thirty actresses, and a child) and kept some twenty-one employees on the "constant charge" (Payroll). In addition two laundresses and a number of seamstresses are mentioned. There were at least five dancers and an orchestra of perhaps a dozen pieces. All this is presented in a section called "The Company at Drury Lane."

The repertoire of the acting company was extensive and varied, as may be seen from the section which provides a calendar of performances for the seasons 1713-14 through 1715-16. This calendar, documented by the manuscripts, adds 144 performances unrecorded in Genest's list for the period, as well as the three isolated performances which may belong to January of 1711/12. All the plays and musical pieces mentioned in the manuscripts are indexed.

Pages 64 to 92 of the dissertation offer a detailed description of the physical theatre and the staging of plays in this period based largely upon bits of information culled from the manuscripts and now first assembled.

There follow sections on playbills and tickets and music (with an index of all musical pieces mentioned in the papers) and a section very full of interesting illustrations drawn from the manuscripts which mention costume and properties. We see that the costumes were varied and sometimes elaborate, that most productions were in "modern dress" but that a few semi-historical or "type" costumes were seen, and that a very large number of properties had to be hired or purchased for the extensive repertoire of the company at Drury Lane.

Pages 130 to 482 of the dissertation are occupied with careful transcriptions of the manuscripts themselves. They are chiefly arranged in two series: dated and undated. A comparatively few documents relating to Cibber, Booth, Wilks, and their quondam partner Owen Swiney (but of a later date than the main group of manuscripts) were found in the course of the study and are included in a separate section. The manuscripts are provided with a glossary of unfamiliar words found in the papers and complete indeces of plays, music, and persons – actors, actresses, employees of the theatre, tradespeople, and other persons – mentioned in the manuscripts. A bibliography accompanies the dissertation.

The manuscripts studied cover only a very short period but there are many of them. No similar theatrical manuscripts exist for this period. Newspaper accounts and playbills this early are extremely fragmentary. Each fact in these manuscripts of Cibber, Booth, and Wilks yields a piece of the jigsaw puzzle of tiny facts which is here assembled to provide a picture of The Theatre-Royal in Drury Lane during a few years of its flourishing period at the beginning of the eighteenth century.

553 pages. \$7.05. Mic 57-994

FRANCISCO JAVIER EUGENIO DE SANTA CRUZ Y ESPEJO: A MAN OF THE ENLIGHTENMENT IN ECUADOR

(Publication No. 20,050)

Philip Louis Astuto, Ph.D. Columbia University, 1956

Francisco Javier Eugenio de Santa Cruz y Espejo (1747-1795) was a prototype of the Enlightenment, a man of science and a leader of public opinion. Despite the fact that he was a mestizo, born in Quito which was an intellectual backwash of Spanish America, he surmounted both racial and environmental obstacles to gain the respect of his fellow quitenos as a learned man and enlightened physician and writer.

Although a master of sarcasm, irony, burlesque, and especially of satire in the form of the anonymous pasquin, Espejo was never a literary giant. He took up pen to teach and reform Quito, not to edify his readers. His style, which lacked grace, elegance, and often good "taste" (which he paradoxically sought in contemporary writers) betrayed his didactic and utilitarian purposes.

Espejo's life was full of frustrations and struggles. His rebellious, irascible spirit, not in conformity with his environment or his time, made many enemies for him among the civilian and ecclesiastical authorities. Discontented with poverty and primitiveness everywhere, he sought change in everything. His educational proposals in El Nuevo Luciano were a patent effort to alert Quito that it possessed a learned man who was abreast of the European "reform" movement. La Ciencia Blancardina mirrored his bitterness and disappointment at the rejection of his proposals and himself. Up to 1785 Espejo believed that writing was the key that would unlock the doors of Quito's society, but he soon learned that Quito was not prepared to know the truth. Espejo's economic and social works - Discurso (1789), Voto de un ministro togado (1792), and Memorias sobre el corte de quinas (1792) did not deal with platitudes but offered concrete solutions to local problems. His faith in the Sociedad patriótica as the answer to Quito's pressing economic, political, and social problems manifested his insight and understanding of the society's possibilities. The newspaper, Las Primicias de la Cultura de Quito, évidenced that hope. To his mind, the demise in 1792 of these two instruments of the Enlightenment in Quito as a result of indifference, partisan jealousies, and the resistance of colonial officials revealed the frailties and inadequacies of persons and means. From 1788 Espejo was convinced that a change in government was necessary to make equality the cornerstone of a new society. Although complete knowledge of his political thought is lacking, enough is known to conclude that Espejo was not a thorough-going revolutionary who was prepared to repudiate the established order. The fact that he advocated a change in government, from monarchy to republic, but favored retaining the privileges of the Roman Catholic Church (with certain administrative changes) showed that he was unwilling to break with tradition.

Espejo was not original. His views had their counterparts in the writings of "enlightened" European and American savants, and philosophers. In a large measure, his greatness lay in the fact that he was an enlightened man in Quito who espoused widely-circulated reforms in this

backward colonial city. He was the channel through which the ideas of the Enlightenment drifted down to the people of Quito. Opposed and shunned by the colonial authorities and quiteño society, he labored indefatigably for the economic and social betterment of the people. Ecuador, for example, has embraced him as its native son and precursor, and has had his bust placed in the Pan American Union alongside other outstanding Hispanic American national heroes. The unqualified love and respect for this quiteño is due in a large measure to the fact that he has symbolized the rise of the underdog. Dedicated to the happiness and progress of Quito he fought for its achievement – albeit fruitlessly in his lifetime – to the last.

262 pages. \$3.40. Mic 57-995

SHAKESPEARE AND ROMAN HISTORY

(Publication No. 20,101)

John Leeds Barroll 3rd., Ph.D. Princeton University, 1956

This is an approach to Shakespeare's Julius Caesar and Antony and Cleopatra in terms of Renaissance attitudes towards the relevant episodes in Roman history. The problem has been approached from three directions. The first three chapters are devoted to a survey and evaluation of Roman history as it was transmitted through the various media by which it reached the sixteenth-century reader. Chapter I surveys the source-writings: the Roman and Greek accounts in question. Chapter II is a general study of the Christian synthesis as it was characterized in writings throughout the Middle Ages, and Chapter III surveys those accounts of Rome written by various popular historians in England and on the continent in the sixteenth century, presenting what appear to have been basic attitudes which might illuminate the interpretation of Shakespeare's two plays. These last two chapters are supplemented by appendices which summarize salient portions of various representative works written in the middle ages and in the Renaissance on the subject of Roman history.

The second approach takes the form of two sourcestudies which have the purpose of tabulating more precisely than heretofore Shakespeare's deviations from Plutarch in each of his two plays and which therefore aid in determining, to some extent, artistic purpose at various points in the dramas. These studies are also relegated to appendices.

The third manner of examining Shakespeare's two plays is dependent upon the idiosyncrasies of the individual dramas. As regards Caesar, the study has been confined to demonstrating how general Elizabethan attitudes might pre-determine the interpretation. With Cleopatra, several plays on the same subject and a close study of various aspects of technique have been utilized to suggest a probable meaning for the play as a whole.

Results, in general, are as follows. The Roman historians all condemned the civil wars and generally regarded the accession of Augustus as the successful solution to the disasters of internal strife. Opinions were divided on the question of Brutus' assassination of Caesar, but writers were, on the whole, inclined to condemn

Antony and Cleopatra in their attempt to seize the empire for themselves. The Christians, who drew most of their history from late epitomes, shared in the endorsement of the empire, but because their religion posited a detailed plan for the total history of mankind, the hegemony of Rome was regarded as one element in a series of four world empires. This view had the result of minimizing the Roman civil wars in favor of the relationship of the city to the rest of the world and to history in general. Consequently, those characters who are the subject of our study are not mentioned in much detail by medieval chronicles.

In the Renaissance, those Roman historians favored by the middle ages were the first ones translated and, from an examination of historical writing produced in England at this time, we may assume that these ancient works were utilized very much as they were utilized in the previous centuries: namely, as eloquent reinforcement of current Christian doctrine. Outlines of this basic assumption are to be seen as late as Ralegh's History of the World which did not, however, extend to an account of the Roman civil wars.

The most important assumption of the "current Christian doctrine" was the idea of a divine providence as operant in pagan history. This suggested that characters who met with failure and death in those episodes treated by Shakespeare met their ends with divine sanction. Thus, since both Brutus and Julius Caesar died violently, our examination of Shakespeare's play is an attempt to show that Caesar's death was as deserved as was that of Brutus, history being meant to serve as a moral lesson.

In Antony and Cleopatra, the failure of the lovers to gain what the Christians regarded as the fourth monarchy is suggested to be a reflection of God's disqualification of the couple in favor of Augustus. Utilization of departures from the source and of other treatments of the story lead us to the conclusion that Shakespeare was conducting his exposition of Antony in terms of addition to fleshly vice, while Cleopatra was presented in the conventional terms of an Acrasia-figure which lures the masculine mind away from a pursuit of the Elizabethan political virtues. In these terms, the couple could be regarded as erring historical figures whose falls would teach the audience the moral lesson which was the purpose of history.

675 pages. \$8.55. Mic 57-996

A CRITICAL BIOGRAPHY OF JOHN PEALE BISHOP

(Publication No. 20,104)

Jesse Bier, Ph.D. Princeton University, 1956

By an examination of the published works, and of the papers and correspondence of John Peale Bishop now in the Princeton University Library, I attempt to show that Bishop's life illuminates his period – especially the years between the world wars – and that his thought and work provide a record of the times and endure as significant contributions to American literature. A man of high sensibility and penetrating mind, Bishop confronted the disorder in his times and found personal salvation only intermittently in artistic production. Unable to surrender himself

to existing coteries or sects, he greatly valued social tradition and vital Christianity but found both unavailable to him. I maintain that his physical illness and eventual death are closely related to his longstanding spiritual malaise.

Chiefly from his essays and related papers I deduce his philosophy and the main tenets of his social and literary criticism. Bishop's principal intellectual conflict was between a ruling Spenglerianism, which condemned his age and country as moribund, and a belief in passionate love, saving artistic endeavor, and a whole view of human nature as sustaining values for the individual notwithstanding his diminished contemporary age. His literary criticism accorded the highest praise to art, where salvational myths were still possible of achievement. He generally emphasized the importance of poetry to civilized man, and he particularly stressed the poet's necessity of balancing the requirements of sound and sense in order to furnish men with a proper release from time. His criticism of novelists continued his emphasis on the importance of form. His standards of literary criticism show him a lucid and honest critical judge. I elucidate a number of his essays as models, in themselves, of expository art.

The prose fiction - Many Thousands Gone, Act of Darkness, short stories - generally focused on his native south which, portrayed in decline, becomes a microcosm for our whole culture. Bishop's greatest strength is to translate such an idea, through his characters, in affecting emotional terms, especially in Act of Darkness. I argue that his sense of structure and his subtle manipulation of symbols are particularly rewarding.

Bishop's poetic career was one of steady liberation from models, but I judge that the question of influences has heretofore distracted his critics unduly from consideration of the poems themselves. His best poems, like "Speaking of Poetry" and "Perspectives are Precipices," influenced or original, display a high sense of discipline, a technical excellence in which the primary quality is the expression of a complex thought through apparently the slightest means. In explication, I try to reveal Bishop's scrupulous attention to sound, dexterity with symbols, and sense of economic structure in his poems, the best of which are peer of any of his time.

Throughout my dissertation I investigate drafts and fragments related to Bishop's published works to illustrate his range of experimentation and his painstaking creative processes. My examination of his unpublished creative work, like the novel The Huntsmen Are Up in America, and his diverse literary projects and activities, seeks to underscore Bishop's versatility. My citation of letters to Bishop - from such friends as F. Scott Fitzgerald, Allen Tate, and Edmund Wilson - is meant not only to clarify Bishop's works but also to demonstrate his reputation, which ought now to be fully recovered. For apart from Bishop's illumination of an era that often shared his doubts, most of his circumscribed but durable literary production remains instructive and impressive for a period that, in a sense, has outlasted the man. My thesis is that such work deserves high consideration as a significant contribution to American letters.

537 pages. \$6.85. Mic 57-997

THE PROBLEM OF THE PRESENCE OF THE AUTHOR IN THE NOVELS OF FRANÇOIS MAURIAC

(Publication No. 20,109)

Wallace Campbell Boyce, Ph.D. Princeton University, 1956

The relatively recent interest in novelistic technique has included the consideration of the author's presence in his work. Here the influence of Flaubert and James, and among the critics, Percy Lubbock, has been strong. François Mauriac's most vociferous critic on this score has been Jean-Paul Sartre, who insists that Mauriac's work is laid before the reader by a God-like author. Mauriac and others have replied that art is not simply a reproduction, but a transposition of life and as such, the author does order his work. The question then arises: with the author controlling, how can the work become alive and the reader enter into the very life of the work?

The novel can be related and understood as though it were seen through the eyes and conscience of one or several characters. Mauriac has achieved a living quality using this technique in Le Baiser au Lépreux and Les Anges Noirs, whereas in La Fin de la Nuit, cited by Sartre in his criticism, although at times the novel unfolds from the characters outward, there are numerous occasions where the author steps in with his overpowering direction and explanation.

In telling the story through a first person narrator Mauriac is at his best in <u>Le Noeud de Vipères</u>. In other novels there is often a distracting element in the narrator's being not enough the contemporary character, but too much the narrator with his personal comments or generalizations on the problems at hand.

Another technique of concealing the author is by a consistent use of interior monologue. It is employed throughout all of Mauriac's novels, but most forcefully in Thérèse Desqueyroux. The reader easily enters into the life of the work through the recollections and reactions of Thérèse. The language of the unexpressed thoughts are in keeping with her personality.

Mauriac's omniscience as an author appears in almost every novel. In this technique he uses objective description, he makes moral judgments, peers into the minds of his characters and reveals to the reader sometimes what no one knows except the author. The more consistent Mauriac is with his omniscience, the more it is accepted by the reader as part of the fiction. Consistency, however, is difficult because of Mauriac's combination of techniques.

In unfolding his story Mauriac has chosen to make the action, the interior monologue, flashbacks, and the sense of unity convince the reader of the living quality of the characters and their problems. The characters are revealed by their actions, their opinions of others, the opinions of themselves by others and through their introspection. Yet Mauriac feels the necessity, as he does when he is treating certain themes, which are already partially understood by the reader from the action and words of the characters, to more amply explain the character and his struggle. The predominately religious themes appear to be of such moment to Mauriac that he steps into the living fiction he has created; he adds fuller explanations, generalizations and advice for the reader.

There is in much of Mauriac a double authority, that of the fiction itself and that of the author. When a novel contains a certain language, or tone, or mood, or coherence or expectancy, but from time to time receives exterior comments from the author or narrator, then there is a loss of the reader's rapport with the fiction. This presence of the author defeats his purpose of creating a living situation and moving the reader to an understanding of himself and of the unrest of his fellow Christians.

173 pages. \$2.30. Mic 57-998

DICKENS AND EDUCATION: THE NOVELIST AS REFORMER

(Publication No. 20,111)

John Archer Carter, Jr., Ph.D. Princeton University, 1956

This study explores the relationships between Dickens' novels and the condition of education in mid-Victorian England. Three lines of investigation determine these relationships.

First, the novelist was well-informed about the state of English schools; his letters, speeches, articles, and the journals which he edited exhibit not only his concern for the education of the poor but also his thorough knowledge of corrupt practices in existing schools. Dickens edited Household Words, a weekly periodical, for nine years during the 1850's; in that journal Dickens published a great number of articles which called to the attention of the public the desperate need for a national system of education. The journal repeatedly emphasized the dangers of mass illiteracy and the abuses of private schools. Two kinds of historical documents have been investigated for the purpose of confirming the accuracy of the novelist's statements and the validity of his argument for reform. Government reports and secondary analyses drawn from these reports provide reliable information about the condition of education; Victorian periodicals reveal the climate of opinion and give some indication of Dickens' reputation as a reformer.

The second line of investigation grows out of the first; it examines the schools in Dickens' novels in the light of historical evidence in order to determine whether these schools justly represent institutions which actually existed in England. This study is not exhaustive; it considers only the schools in Nicholas Nickleby, Dombey and Son, David Copperfield, and Hard Times. The evidence proves that the treatment of children, the qualifications of schoolmasters, and the pedagogical techniques which Dickens described in connection with these schools were based on fact.

The major part of the dissertation is devoted to the third aspect of the investigation. A critical examination of each of the four novels cited above suggests the several ways in which Dickens made the novel serve the purposes of the reformer. The school and the educational theme are examined in their relationship to the plot development and the theme of the novel as a whole. The chapter on Nicholas Nickleby gives special attention to the serial form of publication of the novel and the bearing which this form of publication has upon the educational theme. With regard

to the later novels three techniques in particular are discussed: the use of character, the use of environment, and the conflict between reason and the imagination. The school pupil serves a double function in the novel: he becomes involved in the progress of the story and, at the same time, he continues to represent the educational institution which he attended. The relationship between school and society becomes clearer when the school as an environment is compared and contrasted with other distinguishable environments within the book. For Dickens the faculty of the imagination has a most important function in the development of the child, a function which the predominantly intellectual education of the times tended to depreciate. It is through the imagination that the child develops his sensibilities and becomes aware of the moral values which he must embrace if he is to find personal happiness and be of service to his society.

257 pages. \$3.35. Mic 57-999

MOLIERE AND THE BAROQUE RHYTHM

(Publication No. 20,113)

William Graham Clubb, Ph.D. Princeton University, 1956

The purpose of this study is to describe Molière's style of comedy and to relate it to the literary movements and currents of thought of seventeenth century France. I examine the basic structure of the plays, the five dominant figures of rhetoric employed by his characters, the Molieresque concept and use of comic dramatic portraiture, and, in conclusion, propose that a comprehensive definition of the form and style of Molière's comedies offers, aside from its intrinsic interest, a basis upon which many problems of Molière research and interpretation can be solved.

In almost every play Molière uses a simple farcical plot, which he expands either by inserting many short episodes, or by extending and delaying the exposition, so that in his comedy of character, complication of action is supplanted by depth of characterization. Thus his plots do not exemplify the classical ideal of one action, complete, unified, and coherent. They are incomplete, for the plays are closed by improbable denouements which leave important ethical problems unresolved. They are not unified, for Molière usually develops episodic or extraneous material further than logic of plot demands or properly permits. They are incoherent, structurally, for incidents are not necessarily caused by the preceding, nor linked to the following, action. Molière makes these loosely articulated structures cohere, however, by arranging his materials in a three-part baroque rhythmical pattern comprising (1) symmetrical exposition of the conflicting forces (2) accelerated interplay of those forces, heightening the dramatic tension, and (3) final resolution in physical action, uncontrolled fury, farcical stage-play, or ballet - any of which may release dramatic tension without however solving all the problems dramatized. This cycle usually governs the play as a whole, the acts and scenes, and often the tirades. Constant recourse to mechanical or "subrational" means of resolution implies that Molière considered his final judgements only pragmatically valid.

The dominant figures of rhetoric employed parallel many of the structural features. Unbalanced characters speak in hyperbole, characters grouped antithetically couch their arguments in antitheses, unresolvable conflicts are crystallized in paradox the characters create an interplay of truth and illusion by using irony and mimesis. With these figures Molière increases the depth and realism of his dramatic portraits. Although his characters are farcical in broad outline and in many of their actions, they are "projected" from their dramatic frame and made to reflect human behavior realistically. But they are always drawn back into that frame, and their problems are solved in the farcical mode.

Molière's moral, philosophic, and dramatic uncertainties, the cause of so much critical disagreement, and the rhetorical devices reflecting them, are characteristic of the styles in art called "manneristic," which resulted from a disintegration of high Renaissance styles. They are antagonistic to the pure classical qualities of clarity, coherence, and order. In distorting reality, these devices are in opposition to classical realism. In having no fixed structural center, no single principle of stability, these works are resistant to the classical imposition of reason and order. But an order is imposed by a baroque, energetic and ethically pragmatic resolution of the dramatic tensions. In Molière energy, rather than any rationally established authority, rejects ethical ambiguities. Behind that energy is the weight of a society insisting upon a free, but orderly, play of human activity. This attitude and the structural and stylistic features mentioned above characterize the baroque comedy of character in the mature form given it by Molière. 127 pages. \$2.00. Mic 57-1000

FORGUES: NINETEENTH CENTURY ANGLOPHILE

(Publication No. 16,937)

Moira Anne (Curr) Helgesen, Ph.D. University of Colorado, 1955

Supervisor: Assistant Professor R.-L. Hébert

The study of comparative literature, the relations and interactions of one nation's literary works with the peoples and literatures of other countries, is an aspect of literary activity which has come much to the fore in recent years. A comparatively new branch of study, it can nevertheless count supporters and converts in its ranks from previous centuries.

This present work is the evaluation of one of the now lesser known French devotees of the literature of England and its repercussions on France, also of the French influences on English literature.

A familiar, even celebrated, figure in his own generation, Paul Émile Daurand Forgues (1813-1883) was a popularizer of English literature in France in the midnineteenth century. Author, collaborator, adaptor, translator and critic, he used any and all means of making known contemporary English literature to his countrymen.

Under the pseudonym of "Old Nick," and later under his own name, Forgues became a familiar and beloved figure in the periodicals of the day, such as the Revue de Paris, Revue Britannique, Illustration and Revue des Deux Mondes.

Nor was his knowledge of things English limited to information he had read or otherwise indirectly acquired. In 1843 he paid a visit to England and made the acquaintance of Dickens, Thackeray, and other literary men of the day. His correspondence and his later friendship with Wilkie Collins show in further detail the esteem in which Forgues was held both in his own country and in England.

In France, he was a member of the literary <u>élite</u> which comprised Balzac, Mérimée, Hugo, Standhal, the Goncourts, Sainte-Beuve, the artist Garvarni, and others.

Forgues' fall into oblivion is the fate which has befallen many of even the greatest writers in the decades following their death, and in Forgues' case this was doubly inevitable since he had concentrated on English literature to the exclusion of that of his own country – a fact which precluded him from consideration as a French critic, whilst the fact that he wrote in French excluded him from being counted among the English critics.

This study tries to show that Forgues' place among other French anglophiles is of some importance, since he did for English works and authors what Sainte-Beuve accomplished for their French contemporaries, and was a

forerunner of the new, impersonal criticism.

Forgues' work is of value because of its revelations of the thoughts and interests of the middle years of the nineteenth century; because of the integrity and sincerity of his approach; and because of his critical judgments, almost all of which are still valid today.

163 pages. \$2.15. Mic 57-1001

THE DEVELOPMENT OF THE FITZGERALD HERO

(Publication No. 18,735)

Harry Payne Heseltine, Ph.D. Louisiana State University, 1956

Supervisor: Professor Lewis P. Simpson

Since Fitzgerald's death in 1940, a considerable interest in his life and work has been exhibited by critics, both academic and otherwise, and many valuable attempts have been made to define the nature of his achievement. But, in spite of the mass of periodical literature devoted to Fitzgerald, there has emerged only a single full-length study of the "Laureate of the Jazz Age." This is Arthur Mizener's The Far Side of Paradise. Its subtitle, "A Critical Biography," accurately suggests the orientation of most Fitzgerald criticism. Aware of the almost too perfectly symbolic pattern of Fitzgerald's life, commentators have frequently sought to transfer that pattern to his work. The result has been a one-sided assessment of his performance. The inadequacies of his personal career are made the bases of certain literary and imaginative inadequacies; if his work is conceded any sort of authority, it is usually felt to be, in Fitzgerald's own phrase, "the authority of failure."

The present study questions neither the peculiarly intimate relationship between Fitzgerald and his writing nor its effect on his artistic procedures. It does maintain that prior knowledge of Fitzgerald's life has too often coloured critics' judgments of his purely literary stature. The

positive aim of this dissertation is, then, to use the relation of the man and his work as the basis for arriving at an accurate account of Fitzgerald's artistic achievement. To accomplish this task, attention has been centred in his fictional heroes, who, as is demonstrated in the introductory chapter, provide the proper clue to understanding his specifically literary merit.

In detail, three lines of investigation have been undertaken. First, there is an analysis of the various techniques by which Fitzgerald transposed his own experience into the record of meaningful literary personalities. Second, his heroes are examined as the embodiments of a consistent set of ideas concerning the nature of Romantic individualism and its operations in the twentieth century. Third, the environments in which his central characters work out their destinies are the subject of some scrutiny. If Fitzgerald's career is the story of his search for a good man, it is equally that of his search for fitting environments wherein morality might be put into effect.

As a result of these enquiries, followed through Fitzgerald's novels and short stories, it becomes evident that one of the major patterns of Fitzgerald's literary career was the progressive coalescence of his mature vision of Romantic individualism with one of his fundamental creative mechanisms - his sense of disaster. Endowed from the first with the ability to create an atmosphere of impending doom, Fitzgerald, as he progressed beyond This Side of Paradise, was forced to find adequate imaginative motivations which might give that sense of disaster a tragic validity. In the end, then, Fitzgerald can be viewed as the writer of modern tragedy rather than the frivolous representative of an era best forgotten. This study does not insist on Fitzgerald's complete success in this role. It does insist on a fresh adjustment in evaluating his literary worth. Such an adjustment must be based on the realization that the basic condition of Fitzgerald's writing is its quality as a sustained effort to plot the course of modern individualism in a series of tragic situations; the method adopted in this study for understanding that condition is the examination of the moral ordeals sustained by his fictional heroes. 265 pages. \$3.45. Mic 57-1002

THE ROMANTIC MYTH OF THE ARTIST'S REGENERATION AND ITS EXPRESSION IN THE SYMBOLISM OF ACHIM VON ARNIM'S PROSE

(Publication No. 20,243)

Roland William Hoermann, Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor Werner Vordtriede

The primary purpose of this inquiry is to fill the need for a comprehensive evaluation of Arnim's shorter prose works. The conventional approach of stylistic and structural analysis has not proven adequate in the past because of the following reasons: the often unpolished condition of the poet's manuscript as submitted for publication, the sheer number and multiplicity of plots involved, Arnim's circuitous mode of narration partly due to his technique of word and idea association, the poet's favor for multiple use of a single significant verse insert or prose section,

and finally the unfinished character of three of his most important prose works, i.e. Martin Martir, Die Kronen-

wächter, and Die Päpstin Johanna.

A study of Arnim's significant prose indicates that the theme of mediation and regeneration is a common denominator. The theme of regeneration or salvation mirrors the prime philosophic and literary concern characterizing the Romantic "Zeitgeist." This is one explanation for the Romantic preoccupation with the fairy tale and its inevitable plot of initial estrangement, mediation, and final redemption. Indeed, the pattern of regeneration in Romantic fairy tales is so striking that a myth of regeneration may be postulated.

A comparative study of this Romantic myth as expressed in the fairy tale imagery of Goethe, Novalis, Arnim, Hoffmann, and Chamisso indicates that the hero figure ultimately represents the artist. Thus a symbolic, idealistic myth of the artist's regeneration can be traced from Goethe forward.

This myth, as expressed in the Romantic "Kunstmärchen," consists of two representational planes: the level of allegory and the level of symbolic imagery. The latter, constituting the chief innovation of Romanticism because it concerns the new perceptual modes, is particularly meaningful for the Romantic poet's representation of his existential problem. The artist's myth on the plane of its symbolic imagery consists of two phases: revelation and perception. In the first phase, an ideal, nonmaterialistic universe is revealed to the artist through the mediation of prophetic figures, of their tools (e.g. hieroglyphs), and of the reborn forms of a nature mythology (e.g. the oak tree, the fountain, the precious stone). Favorable states of mind (e.g. dreaming, madness, blindness) make the artist receptive to this revelation of the inner, essential reality of the world. Perception involves the artist hero's active approach to this nonmaterial reality by means of favorable environmental conditions for observation (e.g. vantage points of time, height, isolation, or subterranean location) or by the use of man-made instruments (e.g. the telescope, mirror, or disguise). All of these symbolic images (motifs and symbols) lead to a state of regeneration, usually represented by a vision of the golden age.

An intensive study in terms of the various revelationary and perceptual images is undertaken for Arnim's Kronenwächter Hausmärchen and Juvenis fairy tales, which form the bridge to his novels and short stories. An extensive study of these symbolic categories is undertaken for his three novels (Gräfin Dolores, Die Kronenwächter, and Die Päpstin Johanna) and for eighteen of his most original tales. In this way, a new insight is afforded into a Romantic poet's mode of composition as well as into the redemptive ethos of Romanticism. As a result, Arnim appears in a new light as the principal link beside Hoffmann connecting Novalis with the symbolist groups of the later nineteenth century. 301 pages. \$3.90. Mic 57-993

ENGLISH METRICAL PARAPHRASES OF THE PSALMS, 1500-1640

(Publication No. 18,997)

Charles Adolph Huttar. Ph.D. Northwestern University, 1956

The translation of the Hebrew psalms into English poetry has always held a peculiar fascination, but never more so than during the Renaissance. Nearly one hundred authors versified psalms between 1500 and 1640 – many of them prominent literary figures, including Wyatt, Surrey, Gascoigne, Sidney, Davies, Bacon, Joseph Hall, Phineas Fletcher, Drummond, Milton, and Herbert, to mention a few.

Although the metrical psalms are an important part of the literary milieu of the Renaissance, there have been very few studies of them from the literary point of view: since 1900, only three dissertations (two of them in German universities) and one article, none of which attempts more than a partial treatment. This study seeks to answer two questions: Why were the metrical psalms written? What are their literary characteristics, and their relation to the main stream of English literature?

Part I, dealing with motives, attempts to elucidate the attitudes of Renaissance poets toward their own art. Both "religious" and "literary" motives were prominent. Some psalms were written as aids to private devotion, others for use in public worship services. Of the latter group the most widely used were the psalms of Sternhold, Hopkins, and their successors, but to remedy the theological and literary faults of this version several alternates were advanced. These Psalters, products of the Reformation, form an important bridge connecting literary with religious history. Another group of metrical psalms, springing from a desire to improve public morals, became a vehicle for religious edification and instruction. The seven Penitential Psalms lent themselves particularly to this moralizing treatment. The "literary" motive is apparent in the work of the courtly poets, of the "popular" writers who filled the poetical miscellanies and songbooks, and of the New Poets whose self-conscious approach to their art involved a more or less definite programme for English poetry. Strongly influenced by France, the New Poets treated the psalm as a distinct and highly elevated genre, and used it to fulfill their ideals of Christian poetry.

Part II examines the metrical psalms for their value as literature. An introductory chapter discusses the problems which faced the Renaissance versifiers: the basic difficulty of any verse translation, the peculiar problems imposed by the poetic mode of the Hebrews, and the compounded confusion caused by misunderstanding the Hebrew poetry. But the "religious" psalms fell short of the ideal for poetic translations because their authors were interested in singability, popularity, or literal translation, more than in good poetry. Both their meter and their diction are generally bad. The "literary" psalmists erred in the other direction, consciously striving for good poetry - but applying Western poetic standards to their Hebrew models. Their psalms follow the more elaborate metrical principles of the New Poets, including the quantitative experiments, and run the gamut from the rhetorical manner through the Spenserian and the metaphysical to the neoclassical. The results, as a whole, are not good. Some poets, however, achieved success, by adhering to the

recognized principles of verse translation. This analysis of the literary characteristics of the psalm paraphrases provides us with an important body of evidence on the canons of literary criticism, for contemporary critics accepted the psalms as worthy of their most serious consideration, and most praised them. The psalms also strongly influenced taste and poetry of their own and succeeding times. In church worship, in home life, and in education, they had their impact on nearly all the population. Neither their metrical influence nor their effect upon devotional poetry can lightly be overlooked.

Appendices include a chart of the metrical psalmists and their work, and a bibliography of the canon of metrical psalms.

378 pages. \$4.85. Mic 57-1003

EMERSON'S "THE AMERICAN SCHOLAR," AND THE OTHER HARVARD PHI BETA KAPPA ORATIONS

(Publication No. 17,653)

Steele Mabon Kennedy, Ph.D. New York University, 1956

Chairman: Professor William P. Sears

The purpose of this investigation was to make a critical study of The American Scholar, the oration delivered on August 31, 1837, by Ralph Waldo Emerson before the members and guests of the Phi Beta Kappa Society of Harvard University, and to examine the relationships of this oration to the 'American scholar' concept as expressed in the other Harvard Phi Beta Kappa orations, 1782-1955.

Oliver Wendell Holmes called Emerson's oration our intellectual Declaration of Independence. Lowell said it was without former parallel in our literary annals. Carlyle wrote to Emerson saying the clear, high melody of it went tingling through his heart. Bliss Perry called it Emerson's most famous speech. Innumerable works have been written dealing with various phases of Emerson's life, but considerations of THE AMERICAN SCHOLAR have been limited in scope and treatment to fragmentary attention and no prior study has been attempted to analyze this oration in toto. Charles Franklin Thwing, president in 1927 of the United Chapters of Phi Beta Kappa, said the prevailing theme of the hundreds of annual Phi Beta Kappa orations relates to the scholar or scholarship, to man and his scholastic and other tools, or to human faculties or functions, interpreted in all possible relationships, human and natural.

The orations considered in this study were those delivered at the annual literary exercises of the Harvard Chapter of Phi Beta Kappa, 1782-1955, copies of which were available at Harvard University. A majority of the orations were in the Harvard Archives, but many were found elsewhere. The roster of the orators through these years reads like a who's who in America. Each oration was read and material which stated or implied some connection with scholars or scholarship was excerpted. However, excerpts were included from orations which ignored the 'scholar pattern.' The 'true' copy of THE AMERICAN SCHOLAR was from the Second Edition, printed in 1838,

and the copy used in this study was the one presented by Emerson to Harvard in 1844. The other orations were in a variety of forms: handwritten MSS, typewritten copies, monographs, in books, newspapers and magazines, mimeographed copies, and one was on 78 rpm records.

It was found that portions of THE AMERICAN SCHOLAR were written prior to the invitation to deliver it and that much of the prepared oration was taken directly from the pages of Emerson's Journals, a significant amount being located in the material not included in the ten-volume published edition. Some of this oration had been used in an address delivered twelve days before the PBK invitation was written.

Using the 'scholar' excerpts from Emerson's oration as the criteria, a comparison of the scholar concept as stated by Emerson and as expressed by the other Harvard Phi Beta Kappa orators revealed a consistent pattern of agreement in various aspects of the characteristics and functions of the scholar. This pattern of agreement was also apparent in the relations of the orations to each other, excluding Emerson. Several points of disagreement were noted.

It has been shown in this study that the American scholar has been the focus of significant attention by many of the leading minds of the eighteenth, nineteenth and twentieth centuries, that a consistent attitude has been expressed and definite action advocated on the part of these representative men. Even though Emerson's THE AMERICAN SCHOLAR has been held up as the definitive statement in this area, the opinions of orators prior to and subsequent to 1837 contained important analyses of the role of the 'American scholar.'

750 pages. \$9.50. Mic 57-1004

C. M. WIELAND AND THE TEUTSCHER MERKUR 1773-1789

(Publication No. 17,810)

Ann White Kurtz, Ph.D. University of Maryland, 1956

Supervisors: Dr. A. J. Prahl and Dr. A. E. Zucker

The subject of Wieland and the <u>Teutscher</u> Merkur is approached from two perspectives, the first evaluates his concept of the journal, its purpose, and his own activity as editor, while the second treats his relationships with contemporary figures who supported his undertaking.

Excerpts from the journal are used to illustrate his concept of the popular periodical modeled after the Mercure de France, and to explain the various features of his program. A discussion of his attitudes toward literary criticism as divulged in the "Vorrede" to the first issue, the quality of the articles, the need of developing a discriminating literary taste among his countrymen is the material covered in the first chapter.

The purpose of the <u>Merkur</u> is treated in the second chapter, where the problem of creating a national journal that can simultaneously be an instrument of culture and a profitable business enterprise is considered.

An analysis of Wieland's career as editor is divided into two parts, the first covering the early period

1773-1775. The second part treats his work as editor and contributor, classifying his works published in the journal from 1775-1789. His efforts to satisfy the demands of readers of various backgrounds and to keep abreast with the changing times are reflected in the prose essays on scientific, religious and social questions.

The second section of the study discusses Wieland's relationships with the successive coeditors and chief contributors of the Merkur. A chapter is devoted to F. H. Jacobi, which reaches a climax in the debate over Wieland's essay, "Ueber das göttliche Recht der Obrigkeit."

Goethe's influence on the journal introduces revealing material on Wieland's relationships with the younger generation. In this chapter, Goethe's early antagonism toward the older poet, expressed in the satirical farce Götter, Helden und Wieland, is investigated at length, since this episode divulges Wieland's magnanimity as well as his remarkable ability to win friends.

The invaluable assistance of J. H. Merck, who served the Merkur as an authoritative literary critic, as art critic, and general contributor is dealt with briefly, since the subject has been covered elsewhere. Bertuch's influence on the journal during the period of his coownership is reflected in an emphasis on scientific essays and travel diaries instead of literary articles. Reinhold introduced a philosophical trend in the Merkur, which became instrumental in the dissemination of Kantian thought.

Schiller is the last of Wieland's assistants during the period under consideration, and his letters to Körner offer informative comments on the editor's ambitions to rejuvenate the journal with his help. The discussion of their association divulges Wieland's generous recognition of the younger poet's ability.

The conclusion demonstrates how Wieland was confronted with the disadvantages of geographical isolation from other writers, lack of a single cultural center in Germany, and competition from the Deutsches Museum, in attempting to realize his plans for a national journal. It also points out how his motives influenced the Merkur, and how he regarded his career as a journalist.

192 pages. \$2.50. Mic 57-1005

MODERNISMO IN TWO SPANISH AMERICAN NOVELISTS: CARLOS REYLES AND PEDRO PRADO

(Publication No. 20,252)

Mary-Eleanor Maule, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor Eduardo Neale-Silva

The term, Modernismo, designates a current in Spanish American literature that reflects the body of attitudes and ideas agitating the end of the nineteenth and beginning of the twentieth centuries. The revolution it represents in the literary arts was sparked by the appearance of Azul, by the Nicaraguan poet, Rubén Dario, in 1888. Because of the large number of excellent poets who rise during the period, and because of the spectacular innovations that were achieved in poetry, more critical attention has been paid to this genre than to the effects that Modernismo had

on prose. In recent years the publication of close textual examinations of the prose fiction of three <u>Modernista</u> writers has pointed up the need for critical studies on other authors in the field. Prose <u>Modernismo</u> is a neglected zone of Hispanic letters.

The literature of twenty-one Hispanic American countries, if taken as a single unit, obviously reveals that the general literary manifestations of any given historical period do not occur simultaneously in all geographical areas. The immediate impact of the poetics of Dario was felt first in the Caribbean nations, then became prominent in the south, slightly later. In Uruguay, Modernismo first becomes evident in prose fiction, not in poetry as usually occurred elsewhere, in 1895. Chile has always been one of the more isolated areas and later to show widespread acceptance of any new movement. The few Chilean poets who experimented with Modernista aesthetics from approximately 1895 to 1910 were of minor importance to the current as a whole. It was not until the early manifestations of Modernista principles had begun to be modified slightly that Chilean literature began, about 1908, to offer original contributions to Hispanic letters within Modernismo.

Chosen for study in this dissertation are two novelists whose works were products of Modernismo, Carlos Reyles (1868-1938) of Uruguay, and Pedro Prado (1886-1952) of Chile. Modernismo began for Uruguayan literature with the prose fiction of Reyles in 1895 whose best novel, Elembrujo de Sevilla, was published in 1921. Prado was a poet as well as novelist, whose first book of poetry in 1908 marks the beginning of a major development of poetry in contemporary Chilean letters, and whose masterpiece is the novel, Alsino, that appeared in 1920. The present study of these two authors contains a brief consideration of the historical and literary background of the period, a discussion of the total body of their respective works, and a critical study of the best novel of each.

Modernismo initiated a profound transformation in the development of Spanish American literary expression. The prose fiction of this current played a significant role in that development and helped maintain the literary vitality of the multiple facets of the movement. Many authors, like Reyles, who began writing during the earlier years of the trend, continue evolving beyond the span usually considered for poetry, to produce their best works much later. Prose Modernismo reveals a wide variety of ideas and approaches, in which the same richness of language is evident in the novel as in the verse. In consonance with the intense individualism exalted by the Modernista artistic precepts is the diversity of subject matter and style: something of this broad scope of Modernista interests is shown by the very disparity between the fictional worlds created by Reyles and Prado. The former was concerned with social and psychological aspects of life, while the latter's works are poetic and philosophical in treatment and themes. Successful application of Modernista aesthetics to the novel resulted in a poetization of the form and a new dimension of literary expression.

324 pages. \$4.15. Mic 57-1006

THE ROLE OF EUROPEAN LITERATURE IN THE PROSE WORKS OF D. H. LAWRENCE

(Publication No. 17,335)

Charles Bernard O'Hare, Ph.D. The University of Wisconsin, 1956

Supervisors: Professors G. N. Orsini, Hazel Alberson, and Haskell Block

Although David Herbert Lawrence, the English poet, novelist, and essayist who died in 1930 did not have the benefit of an English public school and university education, his knowledge of literature within and outside the English tradition of letters was both wide ranging and intensive. Consequently, the role of this background in his own development as a thinker and writer poses an important and complex problem. Since there are references to approximately three hundred individual writers and works of European origin in Lawrence's prose writings alone, his relations with European literature, including the classical Greek and Latin, constitute a major aspect of this problem.

Examining the total of his published prose in a chronological sequence, one is able to see clear patterns of
concentration in the range of Lawrence's acquaintance with
European letters, and significant patterns of change with
regard to the function of this background in his own development. In terms of specific literatures, the range of this
background includes classical Greek and Latin, French,
Italian, Spanish, German, Scandinavian, Dutch, and Russian.
Exclusive of numerous references to classical mythology,
the greatest concentration in range is in the French. Next
in order and approximately equal to each other are classical Greek and Latin, Italian, and German literature. Russian literature follows, and the negligible remainder is
divided between the Scandinavian, the Dutch, and the
Spanish.

The greatest frequency of reference is to classical literature if references to classical mythology are included. French literature supplies the next greatest number of references. Viewing both the frequency and the range in terms of the total body of Lawrence's prose, it is evident that his background in European literature was focused primarily on two areas: the literature of classical antiquity, and the romantic and realistic literature of nineteenth century Europe.

A pattern of change is clearly discernable in the role of this background in Lawrence's own development. In his use of European literature for essentially artistic purposes he moved from a position of relative dependence to one of independence. In the early part of his career, for example, he was indebted to a degree to the French tradition of realism. In the second period of his career he experimented with a fictional technique which may have owed something to his knowledge of the French Symbolistes. By the final period, however, there are no obvious indications of influences or borrowings in his writings, although he continued throughout his career to employ literary allusion for conventionally symbolic purposes.

Lawrence's evaluation of writers and works in the European tradition followed a similar pattern of alienation. Beginning with the war years, he sought in literature affinities and insights which would help him to better understand himself as a writer and thinker in relation to the milieu of his time. He did succeed in formulating the basic terms

of a philosophy; but as his own vision of life became clearer his rejection of the life attitudes he discovered in other writers increased.

Yet the role of European literature in Lawrence's development was not wholly negative. If he rejected most of the elements in the European tradition as he approached the end of his career, it was a rejection based on intimate knowledge rather than ignorance, and it was part of a larger rejection – that of the cultural milieu of the modern world which, paradoxically, he had come to better understand through his study of European literature. Without this understanding he might not have achieved so keen an awareness of his uniqueness as a thinker and writer. Without the sophistication it afforded him he might have stood, finally, as no more than a Midlands genre novelist with something of the prophetic zeal of an insular English Non-Conformist preacher.

490 pages. \$6.25. Mic 57-1007

SYNESTHETIC EXPRESSION IN SHELLEY'S VERSE

(Publication No. 20,145)

Glenn E. O'Malley, Ph.D. Princeton University, 1956

Synesthetic expression, which is based on the assumption that there are perceptible analogies among the data of different senses, has long been recognized as an important feature of Shellye's verse. But the scope and the character of Shelley's use of such expression have not been understood properly, in part because literary synesthesia itself is ill-comprehended and in part because the poet's craftsmanship needs favorable revaluation. Literary synesthesia has both a long history and a diversified background; it should be appreciated in terms, not only of psychological, but also of linguistic and various speculative considerations; and its appearance in Shelley's verse must be judged with regard to a tradition of sophisticated usage and reference in earlier poetry, philosophy, and scientific inquiry. A fair estimate of the imaginative role that Shelley gave to synesthetic expression requires, moreover, a due attention to contexts and especially to the ways in which he patterns intersense analogies throughout poems and adapts them to symbolic themes. This kind of literary concern for Shelley's synesthetic practice has not been observed sufficiently in specialized studies of his imagery, and it would ordinarily be discouraged in more general treatments of his verse by the prevailing views of his poetic deficiencies.

Synesthetic expression first appears as an important aspect of Shelley's verse in Alastor (written in 1815). Thereafter Shelley developed it mainly in poems which, like Alastor, are devoted to the elaboration and refinement of a single great theme, an attempt to order every sort of experience within an imaginative synthesis. For the articulation of this theme, Shelley's fundamental device is a narrative pattern which centers on the apprehension or vision of an ideal being and ramifies in connection with the pursuit, the loss, the recovery, and various features and influences of that vision. In this vision narrative or pattern, synesthetic perception represents at once a

heightening of ordinary sensory experience and a revelation of the harmony of all the senses; and it is so treated in the vision context as to symbolize (or be fused with) a heightening and harmonizing of spiritual experience. This visionary function of synesthetic expression, though most readily apparent in climactic passages which introduce or describe the ideal being, is not confined to such passages. In Alastor, Prometheus Unbound, Epipsychidion, Adonais, The Triumph of Life, and others of Shelley's "ideal" poems, synesthetic motifs regularly are ordered with significantly varying intensity through the whole work.

Much of Shelley's success in articulating synesthetic motifs within his "ideal" poems depends on his extraordinary ability to combine intersense analogies with symbolic structures. In Alastor, for example, there is an intricate symbolic relationship between Aeolian music and rainbow coloring (including the Aeolian harp and prism as basic elements), and sight-sound analogies contribute fundamentally to the rendering of this relationship. In The Revolt of Islam (1817) and subsequent works, synesthetic expression is developed almost exclusively in connection with Shelley's elaboration and refinement of a system of symbols which centers on a stellar Venus and which subserves his vision themes. This development of synesthetic expression is brought to its highest stage in Prometheus Unbound (1818-1819), Epipsychidion (1821), Adonais (1821), and the unfinished Triumph of Life (1822), in each of which the Venus system or complex of symbols is worked out with different emphases and strategies; but certain shorter poems and fragments, most notably To a Skylark (1820) and Orpheus (1820?) reveal important facets of Shelley's synesthetic experiment and achievement.

Shelley's symbolic and structural adaptations of intersense analogy are unmatched in the history of literary synesthesia. To study them is to gain new insight into both the content and the quality of his verse, and to feel especially that his artistic handling of language, image, and symbol merits sympathetic revaluation.

375 pages. \$4.80. Mic 57-1008

NUEVA INTERPRETACION DEL PICARO Y DE LA NOVELA PICARESCA ESPAÑOLA HECHA A BASE DE UN ESTUDIO DE LAS TRES OBRAS MAESTRAS DEL GENERO

(Publication No. 19,589)

Michel Robert Ramon, Ph.D. Northwestern University, 1956

Supervisor: Joseph G. Fucilla

The Spanish picaresque novel is one of the most representative genres of the Spanish genius as well as one of the better known ones of Spanish literature. For centuries the influence of this genre has been felt, not only on the development of the Spanish and European novel, but also on that of other genres, such as the cuadro de costumbres.

The great importance of the Spanish novels of roguery has inspired many Spanish and foreign critics to do research in this field. These researchers have, for the most part, spent their efforts on sociological,

psychological, historical, and other extrinsic types of studies to the detriment of the aesthetic value in these novels.

As a consequence, there exists today not only a mass of contradictory critical opinions concerning the extrinsic value of the <u>picaro</u> and the <u>picaresque</u> novel, but also a lack of artistic appreciation of the three masterpieces of the genre--the <u>Lazarillo</u> de <u>Tormes</u>, the <u>Guzman</u> de <u>Alfarache</u> of Mateo Aleman, and the <u>Buscon</u> of Francisco de Quevedo.

The purpose of the present writer is to show that if the above mentioned masterpieces of the genre are studied as works of art, instead of being explained in terms of something else, it is possible not only to arrive at a better understanding of their real artistic worth, but also at a new definition of the picaro and the picaresque novel.

The introductory chapter of this study attempts to show that the different methods most commonly used in this field are ineffective in solving the problems which exist because they are based on a priori deductions of a contradictory nature and that these methods are also inadequate in explaining the artistic value of the genre's master-pieces.

The author expresses the belief that in order to point out the artistic worth of the masterpieces of the genre it is necessary to study, analyze and judge them as works of art, and that, in order to do this properly, it is necessary to concentrate on the work itself, as has been suggested by recent publications in the field of criticism.

The second chapter of this study attempts to present an historical evaluation of the popularity enjoyed by the three masterpieces studied from the time of their appearance to the present. It also includes an evaluation of the most important critical opinions expressed by Spanish and foreign scholars on these works from the seventeenth century to the present.

The next three chapters are dedicated to an artistic analysis of the three masterpieces. In each case, the author studies each novel in order to show how its plot, characters, atmosphere, language, style, theme and effect are integrated to form a unified and coherent artistic whole. In each case, an attempt has also been made to point out how every phase of each novel compares with the preceding one.

The result of this investigation tends to prove that when an effort is made to find the intrinsic value of the three masterpieces of the Spanish novel of roguery, as has been done in this study, it is possible to arrive at a new definition of the literary picaro and the genre.

This main study is followed by four appendices in which an attempt is made to: a) survey the present state of studies concerning the etymology of the word "picaro"; b) point out the classical antecedents of the picaro; c) compare the picaro with the famous folkloric hero Pedro de Urdemalas; d) show the relationships existing between the picaresque novel and several generos intermedios, such as loas, entremeses, bailes, and jacaras.

301 pages. \$3.90. Mic 57-1009

DIE GESTALT DES KINDES IN DEN WERKEN FRANZ WERFELS

(Publication No. 19,861)

Elizabeth Grunbaum Sands, Ph.D. University of Illinois, 1956

The child in the works of Franz Werfel is predominantly a symbolic figure; it appears frequently and carries great significance. Therefore a study of this motif should contribute to a better understanding of the author's entire work. Since he is very consistent in his treatment, it was possible to single out a few fundamental ideas and then proceed chronologically within the resulting thematic framework.

We must consider in turn the child's relationship to the world around him, his father, mother, and humanity. The young poet begins with lyrics of childhood memories; here a basic emotion recurs; a great longing for a bygone time of harmonious existence, of being loved, and somewhat later a yearning for a capacity to love which the adult has lost. In early short stories we meet a boy of about eleven to thirteen (the age with which Werfel concerns himself most), who as yet feels one with himself, his surroundings and his fellow human beings, but who in growing up experiences a painful awakening: the world about him is not one of harmony but dualisms; he himself is a separate and lonely individual. Even the early and more or less realistic treatment of childhood contains elements which transcend reality, and these gain ever greater importance. - The relationship of father and young son has two aspects. It is depicted as the closest relationship possible in life, for before birth and individuation they were one, and the son represents the connecting link in a chain of generations which comes from eternity, leads through time and thence back to eternity and God. (The enmity between father and son, which is so often treated as the "Generations problem" in German expressionistic literature, does not become a force in Werfel's works until the son has attained an age of social and political responsibility.) If man fails to understand the significant role of the child, if he sins against woman by not revering the mother in her, he commits the one crime which Werfel deems unforgivable: by destroying his child through lack of love he sins against the future of humanity, against God's messianic promise. - Whereas man is portrayed as restlessly wandering and searching, woman is presented as constant and fruitful. As a mother she resembles, in Werfel's early work, the magna mater of ancient heathen cults - later she more and more takes on religious significance similar to that of the Madonna. From the very beginning to the very end she represents "Heimat" to the man, protection and unselfish love to the new life entrusted to her; thus it is her function to help man find his own true self and to make possible a better future for mankind by bearing and tending his son. - In Werfel's late works we meet a child yet innocent but old enough to act of his own free will, one who no longer embodies a mere hope for a better future, but acts as mediator between the eternal and humanity. Like the prophets of old he may lend his eyes and his voice to the divine, so that others may learn through him what they can no longer see or hear for themselves; like the redeemer a young boy may sacrifice himself for others naively, without vanity and without reservation, thus helping to atone for humanity's sins

and setting an example by showing the way back to God to those who have lost it. Although his self-sacrifice contains Judaic elements such as we find in the biblical sacrifice of Isaac, it is predominantly a Christian sacrifice of love.

219 pages. \$2.85. Mic 57-1010

HEROIC RHETORIC AND THE THEATER OF PIERRE CORNEILLE

(Publication No. 20,153)

Albert Donald Sellstrom, Ph.D. Princeton University, 1956

In the 17th century rhetoric was widely cultivated in France as a fundamental skill in speaking and writing. It constituted a key discipline in the curriculum of the collèges and was looked upon as an indispensable foundation for all literary endeavor. Theorists also recognized another, higher form of rhetoric neither academic nor professional in nature. Called eloquence, this higher rhetoric was said to transcend the domain of rules and could be attained only by a few men of great nobility of character. It was in fact a heroic attribute, analogous in some respects to military prowess. The aim of this thesis is to show that rhetoric and eloquence are an essential part of the heroic structure of Le Cid, Horace, Cinna, and Polyeucte.

The gallants and liars of Corneille's earliest plays are the forebears of the heroes of rhetoric found in the four masterpieces. The transformation of the gallant and the liar into a heroic figure begins in La Place Royale and is completed in the little tragedy of Act V of L'Illusion comique. There, the hero defends his infidelity to a mistress and lies to her, but only in the cause of a higher morality.

A sense of moral hierarchy, along with symmetry and logical continuity, is an important aspect of the structure of Le Cid, Horace, Cinna, and Polyeucte; and the "idea of a theater" informing these plays is the moral ascent of a hero together with all the repercussions it occasions in the ordered, continuous world around him. A rhetorized poetics is a probable source, in part, for the emphasis on balance and logical cohesiveness in the plays; but, more important, rhetoric often serves the heroes as a means of moral ascent. Cornelian characters are defined, and define themselves, largely in terms of the intérêts which relate them to individuals or to groups. Placed in a situation where a conflict of intérêts occurs, the heroes attempt to create a new personality unified usually around the higher of the two conflicting intérêts. In this way, they preserve integrity of personality and at the same time transform themselves into more perfect beings. In redefining for themselves and for others the new personality required by a particular situation, Corneille's heroes often make use of rhetoric; they strive to persuade themselves and others that the necessary new personality exists or can exist. Sometimes this rhetoric fails to convince or succeeds only in part, but in the last masterpiece it helps enable Polyeucte to become a Christian himself and to attract Pauline and Félix to Christianity also.

Polyeucte fulfils the "idea of a theater" underlying the four masterpieces, for beyond sainthood there is no higher

order of moral being to which to ascend. In his remaining works Corneille finds other "ideas of a theater," in which the heroes usually do not undergo any change of character and in which rhetoric therefore has a different and for the most part less important role. In the most perfectly wrought of Corneille's plays, however, rhetoric is a strong unifying force.

131 pages. \$2.00. Mic 57-1011

EDMUND BURKE AS LITERARY CRITIC AND ESTHETIC THEORIST

(Publication No. 19,870)

Arlin Keith Skarsten, Ph.D. University of Illinois, 1956

The foundation of Burke's learning and of his criticism was classical and neo-classical. While attending Ballitore Boarding School and Dublin University, the ancient Greek and Roman writers had been his daily diet, and he had learned to respect the authority of Horace and Aristotle and Longinus. Hence, when he first appeared before the public as a critic, during his days of authorship and editorship of the Reformer, he relied heavily upon the rules, upon unity, propriety, and decorum. Throughout his life he continued to read the classics with pleasure and kept them ever at his fingertips to be used as touchstones in judging modern compositions, and even when the rules had been replaced, for the most part, by other criteria, he distrusted any careless neglect of them which could not be justified in terms of the end result or in terms of an attempt to achieve some other respectable ideal.

While Burke was yet learning the rules, other and more innate standards were maturing in his active mind: the moral bias appeared beside the classical bias, and perception took the place of prescription. Although the moral bias was more or less innate, it coincided with and was responsive to that humanistic attitude toward life and art which flourished in the "Club" and in the circle of friends which gathered about Dr. Johnson. Burke was an intimate member of that circle and had gained admittance to it because he shared its convictions that life is a serious matter and that artists as well as citizens have obligations and responsibilities relative to the rest of mankind.

Furthermore, Burke's innate preference for perception rather than prescription compelled him to reject the traditional conceptions of sublimity and beauty and to make an independent, empirical inquiry into the nature of those qualities. His investigation was based upon the scientific-materialistic approach to human psychology recently popularized by the teachings of Hobbes, Locke, Hartley, and their followers. Burke, however, was one of the first to apply "modern" psychology to the problems of esthetics; after the publication of the Sublime and Beautiful in 1757, the method became commonplace at the hands of Kames, Gerard, Priestly, Alison, and others.

Whereas the scientific, empirical attitude had led many thinkers, like Bentham and Paine, to adopt a rationalistic utilitarianism as their "ruling passion," it led Burk in the opposite direction to anti-rationalism and anti-utilitarianism; his personal experiences and observations as well as his fundamental faith in God urged him to conclude that man does not live by bread alone and that, in

the long run, instinct and emotion and "sympathetic imagination" are surer guides to happiness and truth and to an understanding of art and poetry than unaided reason. He believed that poetry is essentially emotional and that it is most effective when it appeals to the passions rather than to the intellect, for poetic symbols affect by sympathy and association rather than by objective description. In so far as he believed and taught these principles, Burke was a part of the Romantic Movement.

Burke, then manifested a kinship with most of the important literary biases of his day, with the classical, the moral, the empirical, and the romantic; yet he always managed to remain superior to any one of them taken separately, and in his own mind he kept them finely poised and balanced, each against the other, and hence was able to achieve a synthesis, a unity representing a microcosm of the second half of the eighteenth century.

232 pages. \$3.05. Mic 57-1012

A STUDY OF THE FUNCTION OF BIRD AND TREE IMAGERY IN THE WORKS OF W. B. YEATS

(Publication No. 20,066)

John Eugene Unterecker, Ph.D. Columbia University, 1956

Yeats's imagery has three functions: it organizes the individual poems and plays in which it figures; it acts as a ready catalyst to composition by providing Yeats with familiar material from which he can begin the construction of his poems and plays; as symbol, it serves as a device for integrating isolated lyric works into larger, more substantial forms.

Of all Yeats's images, those of tree and bird are most pervasive. Developed partly from his boyhood observations in Sligo and London, partly from his occult studies, and partly from his reading in comparative folklore, patterns of bird and tree dominate such early works as the poems "An Indian Song" and "The Wanderings of Oisin," the short story Dhoya, the novel John Sherman, and the play Mosada. Though less functionally used, tree and bird references in other early works anticipate the effective use Yeats was later to make of them.

The best illustration of the integration of a group of related works through consistent imagery is in the Cuchulain cycle, that group of plays and poems Yeats planned early in the 1890's and which he intermittently labored at until the week of his death. The bulk of that cycle is contained in five short plays, three of them directly influenced by the theory of the Japanese Noh drama to which Yeats had been introduced by Ezra Pound. All of the plays, however, are characterized by what Yeats regarded as the most significant contribution of the Noh drama, a central metaphor or image to which are subordinated plot and action. Thus all five plays involve bird imagery, an imagery violent in its first appearance in On Baile's Strand but diminished to "silence" and "a few faint bird notes" in Yeats's last play, The Death of Cuchulain. Though prominent in the last drafts of each of the plays, this bird imagery - most frequently an imagery of hawk and almost always an imagery of birds of prey - is far

more loosely used in the first drafts. The notion that he consciously developed these images to integrate otherwise isolated works is supported by Yeats's essays on symbolism and by his correspondence, particularly his letters to Olivia Shakespear and T. Sturge Moore.

Tree imagery, which had interested Yeats when he read such students of the occult as Éliphas Lévi, Mac-Gregor Mathers, and Madame Blavatsky and which he had noted particularly in the Kalevala, in the Mabinogion, and in those works of William Morris which he singled out for praise, dominates his great play Purgatory.

Here, in what was perhaps his most carefully constructed drama, a play with the technical perfection of a lyric poem and the precise mastery of language that the mature poet brought to his most polished work, a great bare tree integrates plot, theme, and action into a unified whole.

Yeats's tree and bird, isolated into abstractions in his last two plays but echoing their multitudinous early forms, present us ultimately pattern – the design of meaning itself – through which he was enabled to order the disordered world.

291 pages. \$3.75. Mic 57-1013

SUMS OF IRREDUCIBLE POLYNOMIALS WITH COEFFICIENTS IN GF(q)

(Publication No. 18,727)

Ray Paul Authement, Ph.D. Louisiana State University, 1956

Supervisor: Professor L. I. Wade

In 1742 Goldbach conjectured that every even number greater than six can be written as the sum of two odd primes, and every odd number greater than nine can be written as the sum of three odd primes. As recently as 1931, a Russian mathematician, Schnirelman was able to make the first contribution towards the solution of this problem. By using the methods of Viggo Brun he was able to show that every number can be written as the sum of not more than 300,000 primes. In 1937, another Russian mathematician, Vinogradoff, was able to show by different methods that all sufficiently large numbers can be written as the sum of not more than four primes.

In this dissertation we consider an analog to this problem. Namely, that any primary polynomial f with coefficients in GF(q) can be written as

$$f = p + p'$$

where p and p' are irreducibles and deg $p \neq deg p'$.

By the use of methods similar to those of Schnirelman we show that every primary polynomial with coefficients in GF(q) can be written as the sum of at most a finite number of irreducibles. 41 pages. \$2.00. Mic 57-1014

SUMMABILITY OF DOUBLE SERIES BY ABELIAN METHODS

(Publication No. 18,225)

Gus DiAntonio, Ph.D. University of Pittsburgh, 1956

Consider the series $\sum_{i=0}^{\infty} a_i$ and the function f(x)

=
$$\sum_{i=0}^{\infty} a_i x^i$$
. If $f(x)$ is defined for $0 < x < 1$, and if $\lim_{x \to 1^-} f(x)$

=
$$\lim_{x \to 1^-} \sum_{i=0}^{\infty} a_i x^i$$
 = S, then the series $\sum_{i=0}^{\infty} a_i$ is said to be

summable Abel to the value S. Two important properties of Abel summability are regularity and the inclusion of Cesaro summability by Abel summability.

Abel summability of a double series may be defined as follows: Consider the series $\sum_{j=0,\ i=0}^{\infty} a_{ji}$ and the function

$$f(x),y) = \sum_{j=0, j=0}^{\infty} a_{jj}y^{j}x^{j}$$
. If $f(x, y)$ is defined for $0 < x < 1$,

$$0 < y < 1$$
, and $\lim_{\substack{x \to 1^- \ y \to 1^-}} f(x, y) = \lim_{\substack{x \to 1^- \ y \to 1^-}} \sum_{\substack{j=0, i=0 \ y \to 1^-}}^{\infty} a_{ji} y^j x^i = S$,

where the path of approach is arbitrary, then the series $\sum_{j=0,\;j=0}^\infty a_{ji}$ is said to be summable Abel to the value S.

The primary purpose of this paper has been to show that regularity and the inclusion of Cesaro summability by Abel summability are valid for double series under a restricted definition of convergence, which will be called strong convergence. Given the series $S_{m,n} = \sum_{i=0}^{m} \frac{n}{i=0} a_{ji}$,

if for $\epsilon>0$ there exists an integer N such that for each m>M, n=0,1,2,... and for each n>N, m=0,1,2,... there results $|S-S_{m,n}|<\epsilon$, then the series $\sum\limits_{j=0,\, i=0}^{\infty}a_{ji}$ is said to

be strongly convergent to the value s. This definition, which is stronger than Pringsheim's definition for convergence, has been necessitated by the fact that a series $\sum_{j=0,\,j=0}^\infty a_{ji} \text{ may converge in the Pringsheim sense without}$

implying the regularity theorem. This possibility is illusstated by an example in the thesis.

Cesaro summability for double series may be defined as follows.

Let
$$S_{m,n}^{(O)} = S_{m,n} = \sum_{j=0, j=0}^{m} a_{jj}$$
, and for each $k \ge 1$ write

$$S_{m,n}^{(k)} = \sum_{\substack{j=0, j=0 \ j = 0}}^{m} S_{ji}^{(k-1)}$$
 (m, n = 0, 1, ...).

Now define the sequence $\sigma_{m,n}^{(k)} = \frac{S_{m,n}^{(k)}}{\binom{n+k}{k}\binom{m+k}{k}}$. If, for

some fixed k, $\sigma_{m,n} \to S$ as $m \to \infty$ and $n \to \infty$ independently, then the sequence $(S_{m,n})$ is said to be strongly summable c_k to the value s. The following inclusion theorem has been proved. If $S_{m,n}^{(k)}$ converges strongly to s, then $\sum_{j=0, \, i=0}^{\infty} a_{ji}$ is Abel summable to S.

The remainder of the paper is concerned with the following problem. Suppose $\lim_{x\to 1^-}\lim_{y\to 1^-}\lim_{m\to\infty}\lim_{n\to\infty}\frac{\infty}{\sum_{j=0,\ i=0}^{\infty}}$ $\lim_{j\to\infty}\lim_{j=0,\ i=0}$ $\lim_{x\to 1^-}\lim_{y\to 1^-}\lim_{m\to\infty}\lim_{n\to\infty}\frac{\infty}{\sum_{j=0,\ i=0}^{\infty}}$ a_{ji}y^jxⁱ exists. By interchanging these iterated limits in all possible ways 23 others are obtained. Does the existence of the above iterated limit imply the existence of any of the 23 others? If each of the 24 limits is assumed to exist in turn, there arise $24^2 = 576$ possible

implications. The implications which are true are proved, and those which are not true are disproved by counter-examples. 34 pages. \$2.00. Mic 57-1015

LEVEL OF SIGNIFICANCE AND POWER OF THE UNWEIGHTED MEANS' TEST

(Publication No. 20,179)

David Gilbert Gosslee, Ph.D. North Carolina State College, 1956

Supervisor: Henry Lawrence Lucas, Jr.

The method of unweighted means is frequently used in the analysis of data classified two or more ways when the subclass numbers are unequal. The method is easy to use but is approximate. The objective of the dissertation was to evaluate the level of significance and power of the test in order to determine how good an approximation the method affords.

Exact and approximate expressions for the level of significance were obtained by applying theorems given in the literature. The approximate level of significance, or type I error, was found to increase as the coefficient of variation of the variances of the class means increases when the number of classes and the degrees of freedom for error are held constant. The results indicate that the test yields too many significant results, but that the disturbance to the 5 percent level of significance is moderate.

Approximate expressions for the power were developed and checked by empirical sampling experiments. It was found that the power increases as the harmonic mean increases when the number of classes, the degrees of freedom for error and the size of the class effects are held constant. The power obtained by using the power of the test when each subclass number is set equal to the harmonic mean gives a good approximation to the power of the unweighted means' test and is easy to compute.

95 pages. \$2.00. Mic 57-1016

CONCERNING O-IDEALS (Publication No. 20,304)

James Grady Horne, Jr., Ph.D. Tulane University, 1956

Chairman: B. J. Pettis

The notion of o-ideal of Milgram is generalized to abstract commutative semigroups with relation, and in this form it includes the notions of lattice ideal, and completely regular end of P. S. Alexandrov. The concept of prime like o-ideal is defined; this includes the concept of maximal o-ideal in some cases, and in a lattice, coincides with that of prime lattice ideal. It is shown that the space of o-ideals always admits the dual Stone topology, and criteria for compactness of certain subspaces are obtained.

The idea of Silov sub-semigroup of Civin and Yood is extended to abstract commutative semigroups and it is

found that these have an o-ideal space homeomorphic with that of the original semigroup.

In certain cases, the natural correspondence from the maximal o-ideals in a given semigroup to those in a fixed maximal o-ideal in the semigroup, is one-to-one and onto. In the case of the multiplicative semigroup on certain commutative rings with unit, the topology in this latter space can be defined intrinsically to be homeomorphic with that induced by this correspondence. By regarding the multiplicative semigroup Co (X) of functions with compact support on a locally compact Hausdorff space X as a maximal o-ideal in the multiplicative semigroup of all continuous functions on its one point compactification, this leads to a generalization of Milgram's theorem concerning the characterizing properties of the multiplicative semigroup of continuous functions on a compact Hausdorff space. This in turn yields the theorems of Shirota and Civin and Yood concerning the characterizing properties of $C_0(X)$.

More generally, a study is made of the o-ideal structure of the multiplicative semigroup of commutative rings. In any such ring, the o-ideals form an upper complete distributive lattice, and prime like o-ideals are maximal. When the ring has a unit, the maximal o-ideals form a Hausdorff space in the dual Stone topology, though this space need not be compact.

The space of maximal o-ideals is compact and coincides with the space of prime like o-ideals, in rings having "sufficiently many" relative units. Rings in which every maximal ring ideal contains a prime like o-ideal have this property. The class of r-rings is defined and have this property. These include various rings of continuous functions on an arbitrary topological space, as well as the regular rings of von Neumann. In r-rings, an analogue of a theorem in commutative Banach algebras holds; this yields that every o-ideal is the intersection of all the maximal o-ideals containing it.

A sub-class of the r-rings, called u.r.rings, is studied. These are characterized by the property that distinct maximal ring ideals contain distinct maximal o-ideals, and include various rings of continuous complex functions on arbitrary topological spaces; the ideal structure in such rings is similar to that in rings of continuous functions. Other descriptions of such rings are given. It is shown that the space of maximal ring ideals in the Stone topology is homeomorphic with the space of maximal o-ideals in the dual Stone topology.

After showing that the space of o-ideals in the semigroup under union of open subsets of a topological space X is homeomorphic with the space of o-ideals in C(X), the previous results are applied to obtain P. S. Alexandrov's theorem concerning completely regular ends. The multiplicative semigroup on C(X) is shown to characterize completely regular G_{δ} spaces X. A generalization of Kaplansky's theorem concerning the characterizing properties of the lattice of real valued continuous functions is obtained. 147 pages. \$2.00. Mic 57-1017

LINEAR REGRESSION USING LEAST ABSOLUTE VALUES

(Publication No. 19,994)

Otto J. Karst, Ph.D. New York University, 1956

The Problem

Linear regression theory, as usually presented, is based on the least squares property of the regression line. This requires, for adequate understanding, a knowledge of differential calculus which many students do not have. A theory of regression can be built on the properties of a regression line such that the sum of the absolute values of the deviations of the data from it is a minimum. Furthermore, the requisite mathematical background for understanding this theory does not go beyond elementary algebra and plotting of straight lines. The problem of this study was to develop the statistical and educational implications of such a theory of linear regression based on least absolute values, (L.A.V.).

The History of the Problem

The least squares (L.S.) theory of regression has held a dominant position in mathematical statistics because it is mathematically tractable by means of the differential calculus.

The L.A.V. theory has been treated by early writers, such as Laplace and Edgeworth, and more recently by Singleton. However, it has not been extensively developed as a basis for regression theory. There is no evidence that L.A.V. theory has been used in statistical education.

Methods and Procedures

By means of mathematical analysis, the following statistical aspects of the study have been developed:

- I. A general method, with examples to illustrate, for obtaining the L.A.V. regression line from ungrouped, grouped, and weighted data.
- II. The principles for extending this method to three dimensional data.
- III. The general method, with examples, for finding a "best" L.A.V. line for a given set of data.
- IV. The L.A.V. properties of the median of a set of numbers, with implications for the wider use of the median as a measure of central tendency instead of the arithmetic mean.
- V. The comparative study by means of t, F, and X^2 tests of the relative abilities of the L.A.V. and L.S. lines to estimate the slope of the regression line of a theoretical model population.

There is developed a suggested methodology based on field psychology for teaching the principles of the L.A.V. regression theory to students in elementary statistics courses.

Summary and Conclusions

- I. Using only the mathematical prerequisites of elementary algebra and plotting of straight lines, it is possible to develop a L.A.V. theory of linear regression which can be taught to students in elementary statistics courses.
- II. This theory can be extended to higher dimensions than two, only with great difficulty.
- III. There is no significant difference in the abilities

of the L.A.V. theory and the L.S. theory to estimate the regression line of a theoretical model population.

IV. The L.A.V. line has in this study been constrained to pass through the mean point of the data in order to compare it with the L.S. line. When this constraint is removed, a L.A.V. line is found whose sum of absolute values is in general lower than when the constraint holds. In this sense a "best" L.A.V. line is obtained.

122 pages. \$2.00. Mic 57-1018

A NON-SELF-ADJOINT BOUNDARY VALUE PROBLEM ON PSEUDO-KÄHLER MANIFOLDS

(Publication No. 20,126)

Joseph John Kohn, Ph.D. Princeton University, 1956

Let $H_T^*(V)$ be the d_T -cohomology of forms on an almostcomplex pseudo-Kähler manifold V, where d_T is defined by

$$d_{\tau} = \frac{1}{2} (\tau - \sqrt{-1}) \partial + \frac{1}{2} (\tau + \sqrt{-1}) \overline{\partial}$$

for $\tau^2 \neq -1$. $H_{\mathcal{T}}^*(V) \approx H_{\mathcal{T}}^*(V,C)$

The $d\tau$ -Neumann's problem on V is to find a harmonic form φ on V such that $n\varphi = n\theta$ and $nd_{\tau}\varphi = nd_{\tau}\theta$, where θ is a preassigned form on the boundary bV of V. ($n\alpha$ denotes the normal component of α .)

The Poincare-Fredholm methods yields the equation

(A)
$$J_{\tau}(\rho)(x) = a(x)\rho(x) + \int_{bV} G_{\tau}(x,y) \wedge *\rho(y)$$

which is equivalent to the d_{τ} -Neumann problem. The integral must be interpreted in the sense of a principal value for $\tau \neq \infty$. Thus J_{τ} is a singular operator.

The singular operators on ${\bf V}$ form an algebra ${\mathcal G}$. Let ${\mathcal F}$ be the subset of ${\mathcal G}$ consisting of completely continuous operators. We construct a bundle Q whose fibre is an algebra. Consider the algebra \mathcal{S} of bundle maps $S(bV) \rightarrow Q$, (S(bV) is the tangent sphere bundle over bV). Using the Fourier transform, we construct an algebra homomorphism

S: $\mathcal{G} \to \mathcal{S}$ whose kernel is \mathcal{F} . We show that there is an ordinary integral equation equivalent to $\alpha = J_{\rho}$ whenever $J \in \mathcal{G}$ is such that S(J) has an inverse in \mathcal{J} .

Let $Z = \{ \tau \mid Re(\tau) = 0 \text{ and } |Im(\tau)| \le | \}$. Applying the above results to the $d_{\mathcal{T}}$ -Neumann problem, we find that (A) is equivalent to an ordinary integral equation whenever $\tau \notin Z$. The case $\tau \in Z$ is illustrated by the example of the complex euclidean ball.

We also show that the d_{τ} -Neumann's problem is formally self-adjoint if and only if $\tau \epsilon Y$, where $Y = \{ \tau | Re(\tau) = 0 \text{ and } | Im(\tau) | > | \}.$

94 pages. \$2.00. Mic 57-1019

AN EXTENSION OF A MULTIPLE COMPARISONS PROCEDURE

(Publication No. 20,128)

Thomas Eugene Kurtz, Ph.D. Princeton University, 1956

A multiple comparisons procedure of Tukey based on the range and requiring equal variances is extended to a procedure for handling data having unequal variances. Using the 100α percentage points of the studentized range, limits are set about all quantities of the form

$$\{ |(X_i - X_i) - (\mu_i - \mu_i)| / V(g_i^2 + g_i^2)/2 \}$$

where the $\{X_i\}$ have means $\{\mu_i\}$ and variances $\{g_i^2\sigma^2\}$. The user can thus make statements about all simple comparisons with a probability of at least 1 - α of having all such statements be correct. A norm for contrasts is developed so that additional statements about contrasts can be made with no increase in the error rate α . The procedure is compared with a procedure of Scheffé based on the use of the F statistic. Computations indicate that the extension presented here produces interval lengths which compare with the Scheffe interval lengths in about the same way, on the average, as the Tukey interval lengths. The true error rate is shown to be not greater than α for n = 3. For certain special cases, the computed true error rates without exception come out to be not greater than α . It is believed true in general that the true error rate is not greater than α . 72 pages. \$2.00. Mic 57-1020

DUALITY IN PARTIALLY ORDERED VECTOR SPACES

(Publication No. 17,620)

David Barrington Lowdenslager, Ph.D. University of Virginia, 1956

Let M be a partially ordered vector space, which is complete in the sense that every bounded directed upward set has a supremum. An o-continuous linear functional is one such that whenever {xa} is directed upward with supremum x_0 , and $\{y_a\}$ is directed downward with infimum x_0 , and the set $\{z_b; b \in B\}$ is eventually in each order interval $\{z \mid x_a \le z \le y_a\}$, then $\lim_{x \to a} f(z_b) = f(x_0)$. Let M^* be a partially ordered vector space dual to M, which consists of o-continuous linear functionals and is the span of its positive elements. I investigate what further conditions are necessary to insure that a positive o-continuous linear functional on M* come from M, or, more generally, be induced by a set of elements of M which is unbounded in M, but which is bounded as a set of linear functionals on M*. A sufficient condition for this is that M be a vector lattice, and M* an order convex subset of the algebraic dual of M, or, equivalently, that M and M* be dual complete vector lattices of o-continuous linear functionals on each other. This theorem yields quickly the duality theory for the Banach spaces L_p , $1 \le p \le \infty$, for an arbitrary countably additive measure, and thus gives information on the Radon-Nikodym Theorem. The theorem yields more results on the closure of some lattices of operators on a Hilbert space; more generally, a duality of the kind considered above holds for some partially ordered vector

spaces constructed from W*-algebras with traces, even when they are not lattices. However, examples are given when the desired duality fails. One of the fundamental constructions involved in the proofs of these theorems is a duality between the complete, order-convex, directed subspaces of M and those of M*.

68 pages. \$2.00. Mic 57-1021

AN ANALYSIS OF CLINICAL CASES AND NON-CLINICAL CASES AS DETERMINED BY AN ARITHMETIC PROFICIENCY TEST

(Publication No. 20,081)

Myron S. Miller, Ed.D. Michigan State University, 1956

Numerous conjectures have been offered by various interested persons regarding students who show a lack of proficiency in arithmetic. In some cases, sweeping generalizations have been made about such students without the necessary evidence to support them. This study was conducted to obtain evidence concerning at least some of the pertinent questions involved. In particular, the study was an attempt to answer the following questions:

- 1. Do low levels of performance on an Arithmetic Proficiency Test occur in any particular patterns within the new-student population at Michigan State University?
- 2. Does the level of performance of students on the Arithmetic Proficiency Test serve as an indication of the probable attrition of students at Michigan State University?
- 3. Does the level of performance of students on the Arithmetic Proficiency Test serve as an indication of the probable achievement of students at Michigan State University?

In considering the first question, eight categories within the new-student population were analyzed. Scores on a reading test, a writing test, and a psychological test were also utilized. In considering the second and third questions, a follow-up study over a four-year period was completed on some six hundred freshmen composed of students with the highest scores, the middle scores, and the lowest scores on the arithmetic test given in the fall of 1951.

Findings of the Study

Patterns. The percentage of females with low scores on the arithmetic test was significantly higher than the percentage of males. The percentage of freshmen with low scores on the test was significantly higher than the percentage of transfer students.

There was no difference in the percentage of students with low scores on the test for students from Michigan high schools and for students from non-Michigan high schools. Likewise, there was no difference for students from large high schools and for students from small high schools.

For Class A, Class B, and Class D schools as a group, the percentage of students with low scores on the test was significantly lower for students from College-Agreement high schools than for students from non-College Agreement high schools. Class C schools showed a slight reversal of this tendency.

Two (of the eight) preference groups differed significantly from each of the other preference groups. Education students received low scores on the test most frequently; engineering students received low scores least frequently.

Most students with low scores on the arithmetic test received relatively low scores on the quantitative section of the psychological test.

Multiple-deficiency cases (involving reading, writing, and arithmetic) occurred most frequently for students with a deficiency in writing, and least frequently for students with a deficiency in arithmetic.

Attrition. Students with high scores on the arithmetic test showed a significantly higher rate of return than students with middle scores. Students with low scores on the test showed a significantly lower rate of return than students with middle scores. Students with multiple deficiencies showed an even lower rate of return.

Achievement. Students with high scores on the arithmetic test showed significantly higher achievement than students with middle scores. Students with multiple sufficiencies showed even higher achievement. Students with low scores on the test showed significantly lower achievement than students with middle scores. Students with multiple deficiencies showed even lower achievement.

224 pages. \$2.90. Mic 57-1022

SOME STUDIES ON THE ESTIMATES OF THE EXPONENTS IN MODELS CONTAINING ONE AND TWO EXPONENTIALS

(Publication No. 20,191)

Robert Dean Morrison, Ph.D. North Carolina State College, 1957

Supervisor: Henry Laurence Lucas, Jr.

This dissertation is a study of some of the properties of the estimates of the exponential terms in the models

$$Y_i = \lambda_0 + \lambda_1 e^{-Kt_i} + \epsilon_i$$

and

$$Y_i = \lambda_0 + \lambda_1 e^{-K_1 t_i} + \lambda_2 e^{-K_2 t_i} + \epsilon_i$$

in which ϵ_i is NID(0,1) and the K's are greater than zero. Empirical sampling and a Taylor series expansion approach were used to arrive at estimates of the expected values and variances of the estimators of the parameters and of certain test statistics.

A lag regression method on successive first differences was used to obtain two hundred estimates of e^{-K} from each of thirty-four artificially constructed populations containing only one exponential term in the model. From these two hundred samples estimates of the bias and variance of the estimator were found for each population. Approximate ("predicted") expected values and variances obtained by employing the Taylor series approach agreed well with the empirical results. Graphs were drawn to show the relations of the estimated expected values and variances to the parameters of the populations.

A similar study was made of the estimates of β_1 = -(e^{-K}₁ + e^{-K}₂) and β_2 = (e^{-K}₁)(e^{-K}₂) for twenty-six populations containing two exponentials in the model and for thirty-four populations that contained only one exponential term. The empirical and predicted estimates of the expected values agreed closely. In the two-exponential cases, estimates of the variances of the estimators were found by empirical sampling only.

A statistic was constructed for testing the null hypothesis, H_0 : $e^{-K} = 0$ or 1, for the populations containing only one exponential term. The power of the test for the nonnull populations was estimated by two empirical methods: (a) ranking, and (b) assuming that the distribution of the statistic was approximately a Beta function. For the two-exponential case, a test statistic was constructed in the same manner to test the composite hypothesis, H_0 : $(e^{-K_1}, e^{-K_2}) = (0,0), (0,1), (1,0)$ or (1,1). The ranking and the fitted Beta function approach gave close agreement in both the single and double exponential cases. Possible methods of approximating the parameters of the Beta distributions in terms of the model parameters were examined only cursorily, and with no reportable results.

As might be expected, the lag regression method for estimating the exponential terms gave biased estimates. Graphs and tables presented showed the relations between the biases and the model parameters. The estimated biases for the single exponential populations were negative in every case. Estimates of the biases of the estimator for β_1 were positive for all the populations sampled, while the estimated biases of β_2 were negative in all but three of these populations.

Suggestions for further study have been given. Computational results that might be useful for a continuation of the study have been recorded on IBM punch cards.

97 pages. \$2.00. Mic 57-1023

TWO-DIMENSIONAL BOUNDED VARIATION AND ABSOLUTE CONTINUITY

(Publication No. 20,307)

Donald Henry Porter, Ph.D. Indiana University, 1950

Cesari has shown that certain concepts proposed by him provide all that one can hope for along the lines of satisfactory definitions for bounded variation and absolute continuity when applied to functions of two variables. Unfortunately Cesari's definitions are somewhat involved and a certain background in algebraic topology as well as Lebesgue theory is necessary for a clear understanding of the meaning of these terms. For this reason, Youngs elected to employ alternative definitions of bounded variation and absolute continuity which neither explicitly nor implicitly require any knowledge of algebraic topology, and enjoy the further advantage that they are immediate generalizations of the development of the corresponding definitions as they might be given in the case of a function of a single variable.

The primary purpose of the thesis is to provide a proof of the fact that the concepts of Cesari and those of Youngs are equivalent. In addition the last section serves to clarify one of the rather puzzling points common to both

definitions and to provide an example which has some measure of independent interest.

Consider a mapping ϕ from the unit square X^2 into Euclidean 2-space E^2 . Let r represent a 2-cell in X^2 having the property that its boundary curve r is polygonal. A family Γ is defined as the collection of mappings $\gamma: \mathbf{r} \longrightarrow \mathbf{E}^2$ such that $\gamma \mid \dot{\mathbf{r}} = \phi \mid \dot{\mathbf{r}}$. The basic function of Youngs is the 2-dimensional Lebesgue measure of a set and is defined as $v_{\phi}(r) = |[E^2 - \phi(\dot{r})] \cap \bigcap_{\gamma \in \Gamma} \gamma(r)|$. By

means of it Youngs defined bounded variation and absolute continuity without introducing ideas from algebraic topol-

The basic function of Cesari is the 2-dimensional Lebesgue integral of a function that is here denoted by o(y). The definition of the function involves the use of algebraic topology. If $u_{\rho}(\mathbf{r})$ represents the basic function of Cesari then $u_{\phi}(\mathbf{r}) = \int_{\mathbf{F}^2} o(y) dy$.

The definitions of bounded variation and absolute continuity as given by Cesari and by Youngs differ only in the basic functions $v_{\phi}(r)$ and $u_{\phi}(r)$. The equivalence of the definitions is established by showing that the function o(y) of Cesari is the characteristic function of the set of Youngs. The method uses the full power of the Čech cohomology theory and the Hopf extension theorem.

Two questions are settled in the final section. First, why were polygonal 2-cells rather than general 2-cells used in the definitions of bounded variation and absolute continuity? (If general 2-cells are used not even the identity map is absolutely continuous.) Second, is there a $\gamma_0 \in \Gamma$ such that $\gamma_0(r) = \bigcap \gamma(r)$? (A homotopy argument

provides a negative answer.)

52 pages. \$2.00. Mic 57-1024

HARMONIC INTEGRALS ON ALMOST PRODUCT MANIFOLDS

(Publication No. 20,148)

Bruce Lloyd Reinhart, Ph.D. Princeton University, 1956

An almost product manifold V is a connected C ™ manifold provided with a C^{∞} direct sum decomposition of the tangent bundle T(V) into integrable subspaces PT(V) and QT(V); we assume also that V is compact. Local coordinates $(x^1, \ldots, x^p, y^{p+1}, \ldots, y^n)$ exist consistent with the structure. A natural bigrading is induced on the differential forms; this in turn induces a splitting of the exterior derivative d = d' + d'' and its adjoint $\delta = \delta' + \delta''$. Here the adjoint is taken with respect to a metric of the form

$$g'_{ij}dx^idx^j + g''_{ij}dy^idy^j$$
;

such a metric always exists. Special Laplacians Δ' = $\mathbf{d}' \delta' + \delta' \mathbf{d}', \Delta'' = \mathbf{d}'' \delta'' + \delta'' \mathbf{d}''$, and $\Delta = \Delta' + \Delta''$ may be defined. The operators d', δ ', and Δ ' differentiate with respect to x only.

Examples are given of almost product structures; for the torus all such structures are listed. It is shown that the various types of regular curve families on the torus can be combined in a nearly arbitrary fashion; for one

class of curve families, a restriction on the complementary family is proved. A method of K. Kodaira is used to analyze the operator Δ' for certain structures on the torus; it is shown that the Green's operator for Δ' is not in general everywhere defined on $\mathcal{L}_2(V)$, and that the analogue of Hodge's theorem is false.

In the general case of an integrable almost product structure, a cubical differentiable singular homology theory is defined consistent with the almost product structure, and it is shown that this theory is related to the differen-

tial forms by an analogue of Stokes Theorem.

On an arbitrary integrable almost product manifold V the Green's operator G' is defined for every C ∞ section of the sheaf $E = D_x \wedge D_y$, where D_x is the sheaf of germs of differential forms $\phi(x,dx)$ depending on x alone, provided V has a torsionless almost product metric. The construction employs a method of Morrey and Eels (Annals of Math., 63(1956), pp. 91-128) applied to the Hilbert space generated by the C[∞] sections of a subsheaf B of E coherent in the sense of a Dx-module, which means that locally there exists a finite number of forms $\gamma(y,dy)$ generating each stalk as a D_x -module. It is shown that $G'\phi$ is independent of the choice of the coherent sheaf of which ϕ is a section. The necessary differentiability lemma is proved by using the parametrix of Kodaira (Annals of Math., 50(1949), pp. 587-665).

The operator Δ has the property that its solutions are precisely the harmonic forms of pure type; these are also characterized as satisfying $\Delta' \phi = \Delta'' \phi = 0$. If V has a torsionless almost product metric, $\Delta = \overline{\Delta}$; the latter condition is equivalent to the statement that Δ preserves type. If on V a family of almost product structures S(t) is given, where t runs over a domain in Euclidean space, then the dimension $b^{r,s}(t)$ of the space of harmonic (r,s) forms on

S(t) is upper semi-continuous as a function of t.

71 pages. \$2.00. Mic 57-1025

ON THE NUMBER OF SIMULTANEOUS REPRESENTATIONS OF A GIVEN PAIR OF INTEGERS AS THE SUM OF FOUR INTEGERS AND THE SUM OF THEIR SQUARES

(Publication No. 19,867)

Lily Hannah Seshu, Ph.D. University of Illinois, 1956

The required number of solutions r₄(n,m) occurs as a coefficient in the series expansion of a function. In fact if

$$v(v|\tau) = \sum_{n=-\infty}^{\infty} e^{\pi i \tau n^2} e^{2\pi i v n}, \qquad (1)$$

(where v and τ are complex variables and $9(\tau) > 0$) then

$$v^{\mathrm{S}}(v \mid \tau) = \sum_{\mathrm{n=0}}^{\infty} \sum_{\mathrm{m=-\infty}}^{\infty} \mathrm{r_{\mathrm{S}}(n,m)} e^{\pi i \tau \mathrm{n}} e^{2\pi i v \mathrm{m}} (9(\tau) > 0).(2)$$

Here $r_s(n,m)$ denotes the number of solutions in the problem considered when four is replaced by s.

Kloosterman obtained from equation (2) an approximation formula $\rho_s(n,m)$ for the function $r_s(n,m)$ by using the well-known sigular series technique of G. H. Hardy. He also showed that for s = 3.5 or 7 we have $\rho_s(n,m) = r_s(n,m)$. [H. D. Kloosterman, Simultane Darstellung zweier ganzen Zahlen als einer Summe von ganzen Zahlen und deren Quadratsumme, Math. Ann. vol. 116, pp. 319-364, (1942).] Bronkhorst obtained the same result when s = 6, 8. [P. Bronkhorst, Over het Aantal Oplossingen van het Stelsel diophantische Vergelijkingen

$$x_1^2 + x_2^2 + \dots + x_S^2 = n$$
, $x_1 + x_2 + \dots + x_S = m$

voor s = 6, en s = 8. Thesis Groningen (1943).]

Using the theory of quadratic forms Van der Blij determined $r_4(n,m)$ in terms of $r_3(4n - m^2)$ which is known. $(r_3(k)$ denotes the number of solutions of an integer k as the sum of three squares.)

Lomadze calculated $\rho_s(n,m)$ for $s \geq 3$ and gave various results on the associated singular series. [G. A. Lomadze, On the summation of the singular series II, Akad. Nauk S.S.R. Trudy Tbiliss Math. Inst. Razmadze, vol. 20, pp. 21-45 (1954).] His results together with those of Van der Blij show that $\rho_4(n,m) = r_4(n,m)$.

In this thesis the same result is proved directly using a modification of Kloosterman's method.

When ns - m² < 0, Kloosterman's results give:

$$\rho_s(n,m) = r_s(n,m) = 0.$$

In the case ns $\geq m^2$, the function

$$\Theta(\mathbf{v}|\tau) = \sum_{\mathbf{n} \leq \mathbf{m}^2} \rho_4(\mathbf{n}, \mathbf{m}) e^{2\pi i \mathbf{v} \mathbf{m}} e^{\pi i \tau \mathbf{n}} 9(\tau) > 0$$
 (3)

is considered.

It is shown that $r_4(n,m) = \rho_4(n,m)$ by proving

$$\Phi_4(\mathbf{v}|\tau) = \frac{\Theta(\mathbf{v}|\tau)}{\mathbf{v}^4(\mathbf{v}|\tau)} = 1 \quad \text{(all v and } \tau\text{)}.$$

In order to prove (4), certain invariance properties of $\theta(v|\tau)$ are needed, analogous to the well-known properties of $v^4(v|\tau)$. When $s \leq 5$, convergence difficulties occur. A certain double series which, for s > 5, defined a function $\Psi_{\mu}(\tau)$ (related rather simply to $\theta(v|\tau)$) fails, for $s \leq 5$, to be absolutely convergent — an essential property. The difficulty is overcome by inserting in each term, a factor depending on a complex variable z, thus giving a series which is absolutely convergent and defines a regular function $\Psi_{\mu,z}(\tau)$ of z, for $\Re(z) > \frac{1}{2}$. With the help of Lomadze's results on the singular series, the analytic continuation of $\Psi_{\mu,z}(\tau)$ into the region $\Re(z) > -\frac{1}{2}$ and the property

$$\lim_{z=0} \Psi_{\mu,z}(\tau) = \Psi_{\mu}(\tau)$$

are established. The convergence device used here goes back to Hecke [E. Hecke, Theorie der Eisenstein Reihen hoher Stufe und ihr Anwendung auf Funktionen Theorie und Arithmetik, Abh. Math. Sem. Hamburgischen Univ., vol. 5, pp. 199-224, (1927)] and was used by Bateman in an analogous situation. [P. T. Bateman, On the number of representations of a number as the sum of three squares, Trans. Amer. Math. Soc., vol. 71, pp. 70-101, (1951).]

Bronkhorst's work for even s > 5 and the above results

now give the invariance properties of $\theta(v|\tau)$.

Once these properties are proved, the work of Bronkhorst and Kloosterman is easily adapted to showing first that $\Phi_4(v|\tau)$ is independent of v (from the theory of elliptic functions), and next that $\Phi_4(0|\tau) = 1$. The last result follows from a known theorem on modular functions and results already established.

72 pages. \$2.00. Mic 57-1026

CONVERGENCE OF SEMI-GROUPS OF OPERATORS

(Publication No. 20,166)

Hale F. Trotter, Ph.D. Princeton University, 1956

The following theorem on the convergence of semigroups of operators is proved. Let $T_n(t)$ be a sequence of semi-groups of operators on a Banach space X, which have norm ≤ 1 and are strongly continuous at the origin; let Ω_n be the infinitesimal generator of $T_n(t)$. If $\Omega = \lim \Omega_n$ is densely defined, and if for some positive λ the range of $\lambda - \Omega$ is dense, then the closure of Ω generates a semigroup T(t) and $T(t) = \lim T_n(t)$. If the $T_n(t)$ commute then the condition on the range of $\lambda - \Omega$ is automatically satisfied.

A modification of this theorem is applied to derive sufficient conditions for the convergence of random walks to certain types of diffusion processes. In particular, the convergence of certain random walks occurring in genetic theory is proved.

Bochner has defined a notion of subordination for stationary Markov processes. It is shown that it is possible to define such a notion for semi-groups, and the convergence theorem is used to show the existence of subordinate semi-groups. By this method the Lévy formula for the infinitely divisible distributions is derived without use of Fourier analysis.

71 pages. \$2.00. Mic 57-1027

AN EXPERIMENTAL STUDY OF THE RELATIONSHIPS BETWEEN PHYSICAL CHARACTERISTICS AND SUBJECTIVE EVALUATION OF MALE VOICE QUALITY IN SINGING

(Publication No. 19,477)

Ernest G. Sullivan, Ph.D. Indiana University, 1956

This study was an attempt to determine the physical attributes of vocal tone which contribute to subjective

judgments of excellence of voice quality.

The vowels [a], [i], and [u] on the pitches A# (approximately 234 cps) and F (approximately 347 cps) were sung by 18 subjects to provide as much as possible a continuum of degrees of voice quality excellence ranging from very poor to very good. The tones were recorded by means of a Presto Portable Magnetic Tape Recorder, Model PT-900, the distance of the singer from the microphone and the control settings on the recording equipment being held constant for all subjects. The recorded tones were presented, by means of the paired comparison method, to a jury of from five to eight voice teachers. Every tone was compared with every other tone of like vowel and pitch in every possible order. The tones were analyzed on a Sona-Graph. Measurement was made of 22 physical characteristics including intensity of each partial; location, width, and intensity of formants; relationship between intensities of formants; relationship of intensity of partials above 4,000 cps to those below 4,000 cps; rate and extent of pitch vibrato; total intensity; and consonance-dissonance ratio. Each of these factors was correlated to jury mean scores using the Pearson product moment formula.

Subject to the limitations of the present study, the re-

sults pointed to the following conclusions:

1. The proximity of the strongest formant above formant 2¹ to a given optimum location is an index of quality as judged by voice teachers. The optimum location seems to vary according to the vowel and the pitch at which the tone is sung.

2. The intensity of \mathbf{F}_s provides the most significant index of jury tonal preference. The influence of this intensity may be expressed in the following ways:

a. In general, as the intensity of \mathbf{F}_{s} is increased, the tone is ranked higher in quality.

b. The ratio of the intesity of F_s to the intensity of F_1 has a high positive correlation with jury preference. F_s should be between one and two times as strong as F_1 .

c. There is some evidence of correlation between the ratio of the intensity of $\mathbf{F}_{\!\scriptscriptstyle S}$ to the intensity of the fundamental and jury rank order of preference.

- 3. As formant 1 becomes weaker, the tone is judged better in quality.
- 4. There was no evidence from this study to indicate that the width of F_1 or F_s influences jury evaluation of the tone.
- 5. For tones with the vowel [i], as formant 2 becomes narrower, the tone tends to be ranked higher.
- 6. Voice teachers show little preference as to direction or degree of modification of the vowel.
- 7. Singers tend to modify vowels from the average spoken vowel in the following way: [a] to [a] or [a], [a] to [a] or [a], and [a] to [a] or [a].
- 8. There was no evidence of relationship between distribution of energy above 4,000 cps and jury tonal preference.
- 9. For the subjects studied, the optimum extent of pitch vibrato measured from crest to trough is approximately three-quarters of a step in the musical scale.
- 10. A tone produced at greater intensity is considered to be better than one produced at lower intensity, even though both are heard at the same intensity level for purposes of judging.

 211 pages. \$2.75. Mic 57-1029
- l. The strongest formant above formant 2 has been designated as $\boldsymbol{F}_{\boldsymbol{s}^{\star}}$

CONCERTO GROSSO FOR OBOE, CLARINET, PIANO, AND STRING QUARTET

(Publication No. 19,453)

Lloyd Carr Taliaferro, Ph.D. North Texas State College, 1956

The Concerto Grosso for Oboe, Clarinet, Piano, and String Quartet is in four movements (Adagio-Allegro, Lento, Allegro, Andante). The Concerto Grosso is a musical composition attempting to express in modern context the concerto grosso style and medium so popular in the seventeenth and eighteenth centuries. A foreword precedes the manuscript in which the general characteristics of the baroque concerto grosso are stated in their relationship to the present work. The structural elements of the traditional concerto grosso, which make this form

useful to the modern composer, are stated and discussed, and specific works which are precedential to the present composition are enumerated.

Within the foreword is found a discussion of the fact that all thematic material of all movements is based on two short basic motives. This cyclic treatment of thematic material forms a unifying element throughout the work. In each movement only one theme is presented and developed, a practice in keeping with the modern tendency toward economy of material and directness. Both homophonic and polyphonic textures are used within the work and the general style may be descirbed as diatonic with rather free treatment of dissonance and key relationships. The work is not experimental and is well founded in traditional practices although these practices are freely extended into the modern idiom.

Included is a discussion of the four movements individually intended to aid in performance of the work by directing the attention of the players to specific points where difficulty might arise. The first movement is a French overture possessing the characteristics common to this form: a slow introduction in triple meter using dotted rhythms followed by a fast fugal section in duple meter. The same thematic material is used in both the introductory section and the fugal section. The second movement is a song form which presents a rhapsodic development of its theme, and the third movement, a set of continuous variations on the polyphonic chanson Revecy venu du printans by Claude le Jeune, is a scherzo. The last movement is a rondo containing several canons based on the opening motive of the movement's theme at various intervals.

The string quartet may be expanded into a string orchestra (without bass) if a larger ripieno be desired by doubling quartet parts. The technical requirements placed on the performers are moderate both in the concertino and in the ripieno; however, to achieve proper ensemble quality experienced players are required and considerable rehearsal time is demanded. The work may be executed by advanced college students. The manuscript is reproduced in open score in which all parts are untransposed and shown at concert pitch. The performance time is approximately twenty-three and one-half minutes.

100 pages. \$2.00. Mic 57-1030

TONAL RELATIONSHIP THROUGH INTERCHANGEABILITY OF MODE IN THE MUSIC OF THE EIGHTEENTH AND NINETEENTH CENTURIES

(Publication No. 19,480)

Wayne Wilmar Wise, Ph.D. Indiana University, 1956

Although the music of the eighteenth and nineteenth centuries was based primarily upon the major and minor modes, composers derived considerable variety and extensive tonal relationships through the principle of interchangeability of mode. The problem of this study involved the codification of theoretical and compositional practices, and resulted in the following three basic types of interchangeability: Type 1, between tonic major and minor as cited by Piston, Tovey and Goetschius; Type 2, between tonic major or minor and tonic non-major or minor

(modal interpolation) as cited by Schenker and Vincent; and Type 3, as it applies to the various scale-steps (secondary tonics) of a diatonic system as cited by Schoenberg, McHose and Sessions.

Mode is defined as a systematic statement of the most important notes (function implied) which form the basis for music of various peoples and periods. It was presumed that modes organized around the same final are interchangeable and thereby constitute an expansion of tonal relationship. The major and minor modes evolved from (1) the Greek octave-species; (2) the Gregorian modes of plain chant; and (3) the ecclesiastical modes of polyphony. Major and minor are preferable because of their greater organizational possibilities. Late nineteenth and twentieth century theorists have been cited as they pertain to the three types of interchangeability and selected compositions have been analyzed for manner and degree of relationship through change of mode. The most important conclusions are as follows:

- 1. Change of mode is the most logical method of tonal expansion because the nucleus of this principle implies variety with unity.
- 2. Almost any manner and degree of relationship can be justified, although some are more convincing than others. Tonalities a major second, minor second and augmented fourth from the tonic are the most remote and difficult to establish. However, since tonalities may be considered as extended chord progressions, and since the progressions IV-V, bII-I and bII-V appear quite frequently in the music of this period, tonalities a major second, minor second and augmented fourth from the tonic receive some justification.
- 3. Non-major or minor interpolations (archaic arrangements) in a predominately major or minor style receive their most logical justification as some sort of combination between these two parallel modes.
- 4. Manner and degree of tonal relationship was established by a combination of Schoenberg's classifications and Hindemith's "Series one."
- 5. Historically affirmed effects of major and minor have some justification; however, they may be masked by changes in tempo, pitch and intensity.
- 6. An analysis of selected compositions revealed the following information:
- a. There was a chronological development in the use of extended tonal relationships.
- b. Some of the preconceived evaluations of various composers were modified.
- c. Later composers began more development sections in the tonic; fixed points of Classical form were gradually handled with greater freedom; and relationship through double change of mode (\mathbf{E}^{b} or \mathbf{A}^{b} minor in C major) was used infrequently.
- d. Tonal relationship through interchangeability of mode complimented the theories of secondary dominant, tonicization and regions, and affirmed the concept of monotonality.

 261 pages. \$3.40. Mic 57-1031

PHILOSOPHY

A STUDY OF PLATO'S PHILEBUS

(Publication No. 20,095)

Rogers Garland Albritton, Ph.D. Princeton University, 1955

The dissertation is a full exegetical commentary on the Philebus rather than a defense of some one thesis about the dialogue. It is, however, especially concerned to interpret the metaphysical discussions of 23c1-31b1 and to discover their bearing on the difficulties at 15a1-c3 about the One and the Many and on the ethical question to which the dialogue is primarily addressed.

It is argued in the first chapter that Plato took the paradoxes of 15b2-8 to forbid the view that the One (Form) is in any sense "in the indefinite(ly many) becoming things" (15b5) whose character it determines. The alternative that its particulars resemble the Form in respect of that character has been given up at least since the time of the Parmenides. But the problem of participation is restated in the Philebus only to be submerged: the "dialectical" (17a4) method recommended at 16c1-17a5 assumes that things somehow have in them this extraordinary conjunction of "Limit and Unlimitedness" (16c10) and occupies itself with classifying them.

At 21c1 ff., however, "everything in the All" is divided into four Kinds: one that "has Limit," one "Unlimited," a third "Mixed" out of these two, and a fourth, the Cause of their Mixing. We are expressly referred back, at the beginning of this analysis (23b9, 23c7, 9-10), to the earlier saying that things have Limit and Unlimitedness conjoined in them. A presumption is thus established that the same conjunction is now to be discussed as the Mixture of what "has Limit" with the "Unlimited."

The things of the former Kind are certain 'numbers' and 'measures' in various ratios (25a6-b2). Those of the latter Kind are such opposites as the Hot and the Cold, in fluctuating inverse ratio. They are "Unlimited" in the primary sense that they are not at a stand in any definite ratio; they are "becoming more and less" (24e7-8, cf. 24d4-5). In that condition they are called "the Hotter," "the Colder," and so on. The Mixed Kind consists of such 'quantities' of these opposites as are anywhere stabilized in definite ratios by the "mixing in" of the numbers and measures that "have Limit." The ultimate agent of this Mixing is the nous in the soul of the world (26c1-31b1).

The second chapter argues that this doctrine is meant for an account of all coming into being, and therefore of all coming-to-participate, and that the paradoxes of 15b2-8 are thereby in a measure resolved. This interpretation is shown to involve (1) that what participates in Forms must be allowed a definiteness of character not so derived, and (2) that Forms must now be construed "mathematically," as "formulae," so to speak, for the disposition of number and measure in the Mixture. It is argued that these consequences are not intolerable.

The doctrine of Mixture is also meant to instruct us concerning the genesis of concrete goods and the ground of their intrinsic value: the Unlimited opposites take on

Goodness with Being; they are stabilized by nous in proper ratios; what is bad is deviation from Mixture. In this aspect, the doctrine governs the course of the ethical argument, as the third and fourth chapters attempt to show. The "mixed" life of Pleasure and Intelligence which is the good human life is also Mixed in the metaphysical sense: a life of Being, from which Becoming more and less is as far as possible excluded. The various kinds of Pleasure and Intelligence are sorted and graded on this principle (31b2-59d9). Only such knowledge and such pleasures as are disengaged from Becoming are welcomed into the good life (61d1-64b9). The relative values of Pleasure and Intelligence are judged (65a7-66a3) by criteria drawn from the doctrine of Mixture (64b10-65a6), and the final scale of goods (66a4-66d3) finds its explanation also in that doc-357 pages. \$4.60. Mic 57-1032 trine.

JOHN STUART MILL'S THEORIES OF UNIVERSALS IN RELATION TO HIS DIFFERENT THEORIES OF UNIVERSAL PROPOSITIONS

(Publication No. 19,084)

Karim Matta Fathi, Ph.D. The University of Wisconsin, 1956

Supervisor: Professor William Henry Hay

Mill's problem is twofold: to construct universals and universals propositions out of particulars which are alone given in sense experience; and to show how logic can be serviceable in discovering truths.

A particular, according to Mill, is a sensation "whose continuity" in the perceptual field "is not for an instant broken," it is a this-here-now. As no two particulars can occupy the same here now, particulars are not identical, but at most undistinguishably similar.

A universal is a specific resemblance between particulars which are called by the same name. Taking

 $\underline{\underline{\mathbf{Wx}}}$ to abbreviate $\underline{\mathbf{x}}$ is white

and

Rlxy to abbreviate \underline{x} resembles \underline{y} in \underline{Rl} (being-white), then

 $Wx \equiv (\exists y) Rlxy$

Now, if specific resemblance is a two-termed relation, it must be undefined and be identical with white. But if it is considered a three-termed relation, as Mill considers it, the universal can not be defined without circularity. To avoid infinite regress, the specific resemblance must be given the name of the universal. The statement 'x is white' would be equivalent to 'x possesses the specific resemblance called being-white. Therefore, Mill failed to give a satisfactory account of universals in terms of particulars.

Mill's theories of accidental universals propositions are based on his theory of universals. As the universal is a specific resemblance, it involves a reference to individual objects. The universal proposition, which is an expression of a constant and invariable conjunction of universals, refers, therefore, to individual cases. It is composed of conjunctive particular propositions. But as Mill recognized that any number of particular propositions do not exhaust the content of the universal proposition, he added the rule: "Take f as sufficient evidence of g." Therefore, the universal proposition is a combination of an aggregate and a rule, i. e.,

$$(\underline{fa} \cdot \underline{ga}) \cdot (\underline{fb} \cdot \underline{gb}) \cdot (\underline{fc} \cdot \underline{gc}) \cdot \cdot \cdot (\underline{fn} \cdot \underline{gn})$$

"Take \underline{f} as sufficient evidence of \underline{g} ," which Mill took as equivalent to Russell's formula:

(x)
$$(fx \supset gx)$$

Essential propositions are those in which the predicate makes up the whole or part of the connotation of the subject, and, therefore, if true, they are true because of linguistic conventions. They are of the form

(x)
$$(fx \supset (gx \cdot hx)$$

or

(x)
$$(fx \supset gx)$$

where

$$fx = def. (gx . hx)$$

With regard to inference, Mill has two theories about it corresponding to whether the major is or is not considered part of the syllogism. The syllogism, with the major as part of it, is merely apparent inference: the conclusion merely repeats part of what is implied in the premisses. It can not be a genuine inference without a petitio principii, for the truth of the conclusion presupposes the truth of the major. As such, the syllogism can be represented as:

$$(\underline{fa} \cdot \underline{ga}) \cdot (\underline{fb} \cdot \underline{gb}) \cdot (\underline{fc} \cdot \underline{gc}) \cdot \cdot \cdot (\underline{fn} \cdot \underline{gn})$$

"Take \underline{f} as sufficient evidence of \underline{g} "

fs

: .gs

But when the major is not considered part of the syllogism, the syllogism is real inference; the conclusion is not implied in the premisses; it is new. The conclusion in this case is drawn from particular propositions according to the rule. We may say that the conclusion gs is drawn from the major in its partial capacity as an aggregate; and is warranted by the major in its partial capacity as a rule.

Mill's proposal to treat the universal proposition as a rule arises from his commitment to a resemblance theory of universal properties. He succeeds in preserving the validity of the syllogism and in recognizing that the conclusion results from real inference.

147 pages. \$2.00. Mic 57-1033

AN INVESTIGATION AND EVALUATION OF TWO INTERPRETATIONS OF ST. THOMAS' DOCTRINE ON THE OBJECTIVITY OF THE CONCEPT

(Publication No. 20,220)

Sister Mary Mercedes Hachey, R.S.M., Ph.D. University of Notre Dame, 1957

St. Thomas holds that in the act of knowing intellectually the human intellect employs a medium, indispensable from the point of view of both subject and object, the expressed intelligible species or concept, in and through which man attains things as objects of knowledge. The concept is necessary from the point of view of the subject for the reason that the human intellect, a completely immaterial faculty, requires a means through which the quiddity of material things, its connatural object, may be known in intellectual conception. From the point of view of the thing known, the concept, as to content, is something of the nature of the thing, assimilated in an intelligible mode of existence to an intellect in act. The concept is, therefore, both a means of knowledge, and simultaneously something of the thing present within the knowing faculty in intelligible esse. The fact that the concept is, under one aspect, the very nature or quiddity of the thing known, leaves no doubt as to its objectivity.

A diversity of interpretation of St. Thomas' doctrine regarding the objectivity of the concept is exhibited in the writings of two Thomist philosophers, Jacques Maritain and R.P. Roland-Gosselin, O. P.

Maritain, whose interpretation is grounded not only in texts of St. Thomas but in their further explicitation in the doctrinal synthesis of John of St. Thomas, alleges that viewed formally the concept is a medium of knowledge and viewed objectively it is the thing known, objectivized in part in intelligible esse. As a medium of knowledge, a "container," the concept is a pure means, a formal likeness of the thing, the objectivized nature with the designation of proximate term in quo. What is known is the content of the concept, the thing as an object of knowledge, the objective concept quod, the ultimate term of intellection. In its status of means of knowledge the concept is a formal sign, preknown as a means, not an entity in se but a proximate term in quo, by a priority of nature not of time.

As Roland-Gosselin sees it, the concept is a "resemblance" of the thing, a resemblance formed and known not as a formal medium of knowledge, but as an entity in se, a quod, knowledge of which somehow gives knowledge of the thing known. Roland-Gosselin affirms that the concept is formed and known in the same act in which the thing is known in some way by reason of the resemblance that the concept bears to the thing. There is no acceptance by Roland-Gosselin of the concept as a pure means in quo of knowledge, a formal sign, making something known before being first known as a quod, no recognition of a likeness or resemblance in the unique sense of intentional representation as that is understood by St. Thomas, John of St. Thomas and Maritain.

In the concept both St. Thomas and Maritain discern an identity with the thing, in the sense that the content of the concept is something of the nature of the thing present within the intellect in an intelligible mode of existence. Roland-Gosselin asserts the impossibility of an identity between the concept and the thing. His interpretation of

"identity" is an absolute identity always, an identity in all respects. The idea of a partial identity seems to elude him completely.

An investigation of the doctrine of the objectivity of the concept as presented in the writings of St. Thomas, and of its diverse interpretation by Maritain and Roland-Gosselin leads us to conclude that Maritain's position is more consistent with the doctrine of St. Thomas as exhibited in his works and further developed in the synthesis of his distinguished commentator, John of St. Thomas.

156 pages. \$2.05. Mic 57-1034

RADHAKRISHNAN'S AND BRUNNER'S ANTHROPOLOGIES: A COMPARISON

(Publication No. 20,038)

Karimpanamannil Chacko Mathew, Th.D. The Hartford Seminary Foundation, 1956

This thesis is a critical and comparative study of the concept of man in Radhakrishnan's philosophy in the light of Brunner's anthropology.

The introduction of it deals with the backgrounds of Radhakrishnan and Brunner. As Radhakrishnan is an idealist, a brief account of Indian Idealism from the Upanisads to the present time is given to place him in his context. This is followed by a brief summary of Brunner's background, his point of departure and the influence of other men like Kierkegaard upon him.

The plan of procedure adopted in the main body of this thesis is to carry on a sort of dialogue between Radhakrishnan and Brunner. This method is chosen because the author feels that it is the most effective way of defining the views of the two as sharply as possible. However, this procedure is not followed in Chapter I, as it is only a summary of Brunner's view of man.

Chapter II is on the epistemology of Radhakrishnan and Brunner. Radhakrishnan deals with three ways of knowing — sensory, discursive and intuitive — of which, for him, the primary source of religious knowledge is intuition. For Brunner, on the other hand, it is revelation — the Divine-human encounter. Subject-object distinction is transcended in the former, whereas it is not transcended in the latter. The goal of intuition is identity and that of revelation is community.

Chapter III is a brief exposition of the views of the two concerning God, the world and man. Metaphysical continuity is the essence of all philosophical wisdom in Radhakrishnan's thought. Man, according to him, is a microcosm of the macrocosm, which is evolutionary in character. It is self-consciousness that distinguishes him from the rest of the cosmic process. But for Brunner man is a creation of God. He is unlike the rest of the creation in that he alone is created in the image of God.

Chapter IV deals with the problem of evil. Radha-krishnan subordinates evil to his fundamental monism. Consequently, he minimizes the tragic nature of evil. Even the doctrine of Karma loses its fatalistic aspect at his hands. Brunner, on the other hand, has a dualistic approach to the problem of evil and shows a deeper understanding of the radical nature of it than Radhakrishnan. Radhakrishnan's view of evil is ontological—privation of

being rather than an act. For Brunner, however, evil is an act — a positive negation.

Chapter V is devoted to the problem of freedom.

Neither denies free will. There is a different kind of freedom for each, the freedom to be that for which God has "created" man—spiritual freedon. It is an evolutionary goal for Radhakrishnan. But for Brunner it is something lost through the Fall and to be regained. Both are poles apart as to the method of realizing it. Radhakrishnan conceives of it in ontological terms. Spiritual freedom is a state or condition to which man evolves. Brunner, however, conceives of it in existential terms. To be free for him is an act—a moment-by-moment act of faith.

Chapter VI deals with history. Radhakrishnan's view of history is presented as cyclical, because the end and the beginning of history are the same for him. Although Brunner emphatically rejects the cyclical view, this chapter shows that, in the last analysis, his view also is cyclical.

Chapter VII is concerned with the problem of the individual and society. It attempts to show how each one's understanding of the nature of man determines his attitude toward society.

The thesis concludes with a retrospective summation of the findings in the previous chapters.

321 pages. \$4.15. Mic 57-1035

SOME MODERN THEORIES OF NATURAL LAW

(Publication No. 20,061)

Eugene David Mayers, Ph.D. Columbia University, 1956

As an introduction to the issues involved in the age-old controversy concerning the natural law, the divergent views of Hans Kelsen and Morris Cohen are instructive. Thus, while Cohen regards the tradition of natural law as of some merit because of its recognition that the community's ideas of what is fair and just are continually enriching the positive law, Kelsen regards the tradition as basically defective because of the obsolete epistemology on which it rests. Following this preliminary statement of the controversy, more searching inquiry into its merits is undertaken through a detailed analysis and critique of some modern theories of natural law.

Such an examination of representative modern theories shows that a variety of approaches has been taken to the natural law, although it also shows that none of these is free from serious criticism. The "metaphysical approach," taken by the absolute idealists, Green and Bosanquet, rests on the concept of the common consciousness or Greater Self underlying society and also develops the concept of "recognition" as the basis for individual rights. This approach emphasizes the social aspect of law, but it obscures the uniqueness of individual claims and also tends to confuse the law that ought to be with the existing positive law. The "juristic approach," taken by Roscoe Pound, famous for his sociological jurisprudence, lays stress on the public policies or "social interests" which guide judges in deciding cases and also presents a catalogue of the social interests found to be dominant in contemporary law. This approach is commendable for its

empirical temper, but it fails to account satisfactorily either for the value content of interests or for the scale which is to be used in weighing competing interests. The "theological approach," taken by the religious philosophers, Maritain, Rommen, and Brunner, discovers in the supreme right of God the sanction for all human rights and affirms the created order to be the locus of the natural law. This approach combines individualistic and social emphases, but it bases its claims on a questionable epistemology and propounds as absolute moral truths that are clearly relative. Finally, the "moralist approach," taken by the deontologist, Carritt, presents theories of political obligation and of the rights of man developed from the theory of moral obligation first put forward by Prichard. Such an approach reaffirms the individualist element in law, but it suffers from its fragmentary character and from a failure to clarify its metaphysical presuppositions. In summary, the criticisms of these approaches seem to compel the conclusion that the natural law must be categorically rejected.

Yet it would be premature, without further refinement

of the issues, to reach such a negative conclusion. Although, admittedly, natural law theories have virtually fatal epistemological defects, they nevertheless render an invaluable function in explaining the presence of value in legal analysis. Despite its neglect by the adherents of legal positivism, the presence of value is indeed a significant feature of legal analysis; and, to the extent that the modern science of legal criticism must likewise account for it, such a science will be obliged to acknowledge its indebtedness to the tradition of natural law. The science of legal criticism may further profit from the tradition by clearly articulating principles concerning its basic presuppositions, the view of human nature it finds compatible with modern knowledge, and the rights of the individual and of the community, respectively, which it finds appropriate to modern society. Finally, an analysis of two areas of the tradition's concerns, those of property and of the right to resist, illustrates concretely how modern legal criticism might implement such principles.

206 pages. \$2.70. Mic 57-1036

PHYSICS

PHYSICS, GENERAL

SHOCK INDUCED FLOW IN NARROW DUCTS

(Publication No. 20,096)

John J. Allport, Ph.D. Princeton University, 1956

An experimental analysis of the air flow in a narrow duct following the passage of shock wave is presented for a limited range of shock strengths ($M_1 = 1.5$ to $M_1 = 2.75$), and for flow time durations up to 1 millisecond behind the shock. Laminar velocity profiles and skin friction coefficients have been measured and are compared with an existing theory. Transition to turbulent flow is obtained, followed by fully developed turbulent flow. Turbulent velocity profiles and skin friction data are reported. Interferometry, schlieren, a piezoelectric pressure gauge, and a wall temperature measuring device are used to investigate the compressible flow in the shock tube.

61 pages. \$2.00. Mic 57-1037

VIBRATIONAL RELAXATION IN OXYGEN AND NITROGEN

(Publication No. 20, 105)

Vernon Harold Blackman, Ph.D. Princeton University, 1955

A converging channel of area ratio 34:1 has been developed to produce stronger shock waves in the present Princeton shock tube. Two methods for calculating the gain in shock strength upon such a convergence are examined and the results are shown to be in poor agreement

with the experiments. Shock waves of speeds in the range $M_1 = 3-7.5$ in oxygen and $M_2 = 5-10$ in nitrogen have now been studied with the interferometer. The relaxation times for the approach to vibrational equilibrium behind the shock were measured for the widest possible range of temperatures and these values are used to check the validity of the Landau-Teller theory. The density ratios across the shock were measured for a number of shock strengths and the results are compared to values calculated by the Bethe-Teller method taking into account the variation of specific heat with temperature. Agreement between measured and calculated values is satisfactory. Experiments were also performed in oxygen-nitrogen mixtures and the effect of nitrogen on the approach to equilibrium of the oxygen was determined for a small range of temperature. It was also found in this connection that small amounts of water vapor did not noticeably reduce the relaxation time for these strong shocks. A shock detecting device with a signal rise time < 1 sec, consisting of a thin evaporated gold film which changes its resistance when heated by the shock, is also described.

82 pages. \$2.00. Mic 57-1038

ON THE RATE OF SELF-DIFFUSION OF POLYCRYSTALLINE SILVER

(Publication No. 17,604)

John Joseph Connelly, Jr., Ph.D. University of Virginia, 1956

This experiment outlines a technique for obtaining diffusion constants of metals at temperatures well below their melting points by the application of force fields of 160,000,000 times the acceleration of gravity with a magnetic-supported magnetic-drive ultracentrifuge. Three successive layers of silver were electro-deposited upon the cylinderical surface of a 0.05 cm diameter steel rotor. The inner layer (5.5 x 10⁻⁵ cm thick) and the outer layer (1.38 x 10⁻⁴ cm thick) consisted of ordinary silver, while the middle layer (5.5 x 10^{-5} cm thick) contained silver enriched with the radioisotope Ag^{110} . The rotor was suspended and spun in an evacuated chamber. The radial movement of the Ag¹¹⁰ was determined by counting the beta particles emerging through the periphery of the rotor by a scintillation crystal, photomultiplier, and pulse height analyzer circuit as a function of time. The results show that the self-diffusion constant for silver at seventy-two degrees centigrade is approximately 6 to 7 x 10⁻¹³ cm²/sec. These techniques are also of value for the determination of the mechanism of diffusion. The results of this experiment indicate that the mechanism of self-diffusion in silver is the vacancy exchange mechanism.

60 pages. \$2.00. Mic 57-1039

SELF-DIFFUSION IN INDIUM ANTIMONIDE AND GALLIUM ANTIMONIDE

(Publication No. 20,114)

Fred Henry Eisen, Ph.D. Princeton University, 1956

Self-diffusion measurements have been made in the semiconducting intermetallic compounds InSb and GaSb. The material used was single crystal or slightly polycrystalline. Some of it was made in this laboratory and the rest obtained from two other laboratories. A tracer technique was used, in which the crystal was sectioned and the residual activity in the crystal counted. A hold up on the surface of most of the radioactive tracer and the small magnitude of the diffusion coefficients (10⁻¹⁴ to 10⁻¹³ cm.²/sec. near the melting points) limits the precision of the measurements and the temperature range over which they can be made with reasonable annealing times (a range of 40°C. was used for both compounds). The results show that indium and gallium diffuse faster than antimony in their respective compounds. Several possible mechanisms of diffusion can be eliminated as the mechanism of self-diffusion in these compounds. A mechanism is suggested which accounts for the data in a consistent manner. A value of about 10⁻⁸ cm.²/sec. is obtained for the grain boundary diffusion coefficient of indium in InSb. A value of 10⁻⁷ to 10⁻⁸ cm.²/sec. is obtained for diffusion of antimony in dislocations in GaSb.

154 pages. \$2.05. Mic 57-1040

APPLICATION OF SMALL ANGLE X-RAY SCATTERING TO THE DETERMINATION OF THE STRUCTURE OF MACROMOLECULES

(Publication No. 20,235)

Phillip Herbert Geil, Jr., Ph.D. The University of Wisconsin, 1957

Supervisor: Professor William W. Beeman

Two applications of small angle X-ray scattering to the determination of the structure of macromolecules have been made. Intensity requirements necessitated the building of a high power X-ray source. A water cooled, rotating anode, X-ray tube capable of dissipating more than 4 kilowatts was constructed. Data were taken on pinhole and slit collimation scattering systems over an angular range extending from 1.2 to 100 milliradians and over an intensity range greater than four orders of magnitude. Corrections to the measured intensity at any given angular setting because of the use of finite apertures are described for both systems. The relative merits of the two systems are discussed.

The first application is that of determining the structure of Wild Cucumber Mosaic Virus (WCMV) and its related protein component. The preparation and separation of the virus and its protein component are described as well as various biophysical measurements. From the X-ray scattering data the radial electron density of the two particles was determined. It is concluded that the protein component consists of a dense shell of protein with an external radius of approximately 142 Å and an internal radius of 105 Å, the center being filled with less dense material. The nucleic acid of the virus is determined to be located within this protein shell in a region between 30 and 60 Å in radius. The virus particle apparently has a small hole in the center.

The second application is an investigation of the effect of varying the electron density of the solvent in which the scattering particles are dissolved. Most of this work was done with Bovine Serum Albumin (BSA). From the average electron density of the BSA molecule in solution it was determined that almost all of the water of hydration is internal. The distribution of matter within the hydrated molecule is apparently nearly uniform. The average electron density of WCMV was also determined. Evidence for the non-uniformity of the distribution of matter within the virus was also found in the experiments with varying solvent density.

157 pages. \$2.10. Mic 57-1041

ANISOTROPIC STRAIN NEAR A VACANCY OR AN INTERSTITIAL IN LENNARD-JONES CRYSTALS

(Publication No. 17,610)

George Lincoln Hall, Ph.D. University of Virginia, 1956

There are derived two theories of point imperfections in simple crystals under arbitrary external pressure. The crystals are assumed to obey central forces and to be at 0°K; zero-point fluctuations are neglected. The atomic theory, the more accurate one, is a theory of the discrete

displacement of each atom surrounding the point defect, whereas the more approximate theory utilizes linear elasticity. The familiar empirical \mathbf{r}^{-2} law of displacement is only a first approximation to the elastic method here reported.

In both theories the procedure is to replace a crystal with a point defect by a perfect crystal in a known field of force. The strain energy of the perfect crystal and the work done on the perfect crystal by the field of force are quantities of interest. Particular approximations to these two quantities distinguish the two theories.

The vacancy and the interstitial in Lennard-Jones crystals afford a comparison of the atomic theory, the elastic approximation to the atomic theory, and the empirical \mathbf{r}^{-2} . It is shown that the \mathbf{r}^{-2} law is inadequate, but that the elastic approximation gives a good spherically symmetric average of the atomic solution.

According to the atomic tneory of the vacancy, the configuration of displacement at zero external pressure is radially outwards along the cubic axes and inwards elsewhere. Most of the energy of distortion (a negative quantity) arises from the inward displacements of the first-nearest neighbors. As the external pressure increases from zero to a pressure at which the volume per atom is halved, the magnitude of the energy of distortion increases from 2 - 12% of the energy to form a vacancy without distortion. The outward displacement along the cubic axes persists even at such high pressures. If all distances are reduced by the distance between first-nearest neighbors, it is seen that the reduced distance between first- and second-nearest neighbors to the vacancy increases with increasing pressure.

For the interstitial, the atomic theory yields a displacement that is also outwards along the cubic axes and inwards elsewhere. Accordingly, a repulsion is predicted between a vacancy and an interstitial if the line joining the two centers lies along a cubic axis. The energy of distortion is very significant for the interstitial, being about 60% of the energy required to form an interstitial without distortion

The fact that some atoms are displaced away from a vacancy and that some are displaced toward an interstitial is somewhat surprising. However, simple arguments based on the symmetry of the crystal and the force law demonstrate that such configurations should be expected.

54 pages. \$2.00. Mic 57-1042

THE ENERGY LEVELS AND SPECTRA OF NEUTRAL AND SINGLY IONIZED PHOSPHORUS (PARTS I-IV)

(Publication No. 20,133)

William C. Martin, Ph.D. Princeton University, 1956

The spectrum given by the hollow cathode discharge in a Schuler tube containing phosphorus vapor and helium has been photographed and measured from 500-10,000A. This source gives new lines in both the first and second spectra of phosphorus.

In P II 184 lines have been classified and some 80 previous classifications are rejected. The classifications of

55 other lines are affected by the changing of the designations of seven previously listed levels and the assignment to new 4f terms of seven high even levels also listed previously. The total number of classified lines is 383. Thirty-six levels are added in this investigation, and 29 previously listed levels are rejected. In all, the positions of 38 even and 54 odd levels have been determined or redetermined from the new measurements. All the terms of the previously incomplete configurations 3d, 4d, 3s3p3, 4p, and 4f are given. Except for two levels, 5p is complete, and several 5d and 6s levels have been discovered. For most configurations the results are in good agreement with the predictions of Russell-Saunders coupling theory: there is, however, evidence of considerable interaction between 3s3p³ and 3s²3p3d. The principal ionization potential is found to be 19.72 volts.

The previous analyses of P I, which gave 38 real levels classifying 76 of the 85 known lines, have been expanded to include 141 levels classifying 382 of the 488 lines listed here for P I. These additions, and the changing of the designations of five of the old levels, yields new terms for the configurations ns (n from 4 to 7), np (n = 4,5,6), nd (n from 3 to 7), 4f and 5f. Several new terms based on the 3p² D and 3p² S parents in P II are included for P I. The values of all levels are based on the new measurements. In many cases the results are confronted with the theoretical predictions of first order perturbation approximations. The analysis now allows the calculation of an accurate principal ionization potential, which is 10.48 volts.

126 pages. \$2.00. Mic 57-1043

653

SMALL-ANGLE X-RAY SCATTERING FROM COPPER-NICKEL DIFFUSION COUPLES

(Publication No. 20,262)

Gerald White Sharp, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor W. W. Beeman

An investigation of the small-angle scattering of x-rays from the copper-nickel diffusion couple has been undertaken in an effort to observe the eary stages of pore formation in this system and to study the diffusion process in general. The samples used were 0.5 mil spectroscopically pure copper foil deposited electrolytically with a layer of approximately 0.1 mil nickel on both surfaces. These were given diffusion anneals at between 700° and 950°C for varying lengths of time in a reducing atmosphere.

The scattering experiments were conducted using a high intensity x-ray source, a four slit scattering chamber with proportional counter and pulse height analyzer detection and monochromatization. An approximately fivefold increase was observed in the scattering at a fixed angle after a typical diffusion anneal.

Two mechanisms have been proposed to explain the scattering. The most obvious, suggested by other investigators' observations of microscopic porosity, was that the intensity increase was the result of excess vacancies aggregating in the early stages of the pore formation. The other mechanism, suggested by some experiments on deformed metals and the observation of polygonization in the

diffusion zone by some investigators, was that the intensity increase was a result of double-Bragg scattering from a single domain sufficiently small or strained so that its Bragg reflections were physically broadened.

Several experiments were performed to distinguish between the mechanisms. The scattered intensity at a fixed angle as a function of the time of anneal at a fixed temperature showed a rapid increase to a maximum followed by a slow decrease. The decrease was observed to have the kinetics of a diffusion phenomenon. Qualitatively, either mechanism could account for this behavior. The angular dependence of the scattering was also explained qualitatively by either mechanism. The scattering showed essentially no polarization and either mechanism predicted this.

A reversible decrease in the intensity at a fixed angle of about 18% was observed for a temperature rise of 500°C. The cavity model predicted only a 3.4% change, whereas the double-Bragg model was capable of explaining an even larger change in the intensity. The intensity at a fixed angle as a function of sample thickness showed scattering centers on the nickel as well as the copper side of the original interface, with a larger concentration in the copper. Also, it indicated that the scattering from the copper side was from a different mechanism than the scattering from the nickel. The porosity picture predicts scatterers only on the copper side, while the double-Bragg mechanism can explain the scattering on both the nickel and the copper sides.

It was concluded that neither of the proposed models could completely explain all of the experimental results. The two mechanisms apparently supplement each other and work together to produce the scattering. It seems likely that cavities are the principal source of scattering in the copper and double-Bragg scattering in the nickel. It was further concluded that pores formed after diffusion anneals as short as 10 minutes at 900°C, and that some of these were of the proper size to be viewed with x-ray scattering equipment. 101 pages. \$2.00. Mic 57-1044

THE LIQUID HELIUM II FILM GRAVITATIONAL VOLUME FLOW RATE OVER 36 CENTIMETER BARRIERS

(Publication No. 20,265)

James Herbert Werntz, Jr., Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor Joseph R. Dillinger

A beaker filled with liquid helium held below its transition temperature of 2.18° K. (Helium II) will be emptied by mass transport through the abnormally thick adsorbed helium II film on the beaker walls. Gravitational volume flow rate measurements consist of a determination of the rate at which this mass transport takes place.

The experiment was performed in an isothermal enclosure from which contaminating gases and external radiation were carefully excluded. The measuring technique was visual; as the beaker emptied the position of the liquid meniscus was measured as a function of time. Knowing the beaker geometry the volume flow rate, R,

normalized to the least periphery of the beaker above the liquid inside, could be calculated and presented as a function of the distance from the top of the beaker to the liquid level inside the beaker, H, with the level of the liquid outside of the beaker at various distances, $H_{\rm o}$, from the top. Measurements for both H and $H_{\rm o}$ up to 36 centimeters were made.

The gross features of the R vs. H curves with Ho as a parameter were: (1) Lip effect. For H less than one centimeter, large rates were obtained. This effect has been reported consistently by other workers on the basis of results from beakers in which Ho was less than 6 centimeters. (2) Tail effect. For H only slightly less than Ho, R falls rapidly but not abruptly to zero under conditions where extraneous thermal conditions could not confuse the observations, contrary to the results of some workers using short beakers. (3) Excluding the first centimeter and the last few centimeters R decreases for increasing H, and R increases for increasing H₀. This fact directly contradicts theories predicting that R is independent of film path length. The data closely follow a law of the form R = (constant) exp (-constant) • H, in contradiction to theories suggesting a power law dependence of R on H.

A structure, nearly discontinuous in some cases, was observed in some of the R vs. H curves. This structure was not reproducible and occurred under conditions not known to differ in any way from conditions under which smooth curves were obtained. This structure, more completely understood, may confirm a proposal made to understand results of an experiment on the static helium II film performed previously in this laboratory by Knudsen and Dillinger whereby the static helium II film on a solid surface becomes thinner at regularly spaced intervals above a bath of bulk helium II. 141 pages. \$2.00. Mic 57-1045

THE GYROMAGNETIC RATIO OF THE ELECTRON IN THE METASTABLE STATE OF HYDROGEN*

(Publication No. 20,170)

Lowell Deane White, Ph.D.**
Princeton University, 1956

The gyromagnetic ratio (g-factor) of the electron in the metastable state (2S) of hydrogen is measured in terms of the gyromagnetic ratio of the proton in mineral oil (Nujol). The result is $g_{\rm s}/g_{\rm p}=658.2314\pm0.0024$ where $g_{\rm s}$ is the g-factor of the free electron obtained from the metastable state measurement by making the Dirac theory correction for the effect of the binding to the nucleus and $g_{\rm p}$ is the g-factor of the proton in a spherical sample of Nujol. This result agrees within experimental error with the equivalent results from measurements made by others using the ground state of hydrogen.

The basic measured quantities are the frequency of the klystron inducing the transition between two magnetic substates of the metastable state and the resonant frequency of the protons in the mineral oil sample at the magnetic field corresponding to the peak of the metastable state resonance. The transition frequency must be corrected for the Stark shifts produced by the microwave electric field and by the electric field (motional electric field) seen by the atoms as a result of moving in the magnetic field.

In comparing the proton sample with those used by others it is necessary to make small corrections for diamagnetic effects.

The experimental method, apparatus, and results are described. The relevant theory of the hydrogen atom is given. The Stark shift produced by the motional electric field is obtained from theoretical considerations of the experimentally observed line widths. The other corrections to the experimental results are also given. The final result is compared with the experimental and theoretical results of others.

245 pages. \$3.20. Mic 57-1046

*Supported by the U. S. Atomic Energy Commission and the Higgins Scientific Trust Fund.

**U. S. Atomic Energy Commission Predoctoral Fellow 1951 - 1953.

LOW TEMPERATURE THERMAL CONDUCTIVITY OF KCl-KBr MIXED CRYSTALS

(Publication No. 20,028)

Wendell Sterling Williams, Ph.D. Cornell University, 1956

The present experiment was designed to give information on a possible contribution to the residual thermal resistivity of "pure" KCl resulting from isotope scattering of phonons. To magnify the effect, Br was added to the KCl lattice and considered as a chlorine isotope with more than twice the chlorine mass.

Single KCl-KBr mixed crystals were pulled from melts of optical grade Harshaw KCl and KBr. Crystal compositions were determined from density measurements. The crystals were annealed after growth and again after being cleaved to the desired size: $\frac{1}{4}$ " x $\frac{1}{4}$ " x $1\frac{1}{4}$ ".

Temperatures were measured with differential thermocouples made of constantan versus Au, 2.1 atomic % Co and calibrated against a helium gas thermometer built into the experimental chamber. The thermoelectric power of this pair was found to be approximately 0.86 microvolts per degree in the vicinity of liquid helium temperatures. Thermocouple outputs were measured with a dc breaker amplifier and could be read to \pm 0.01 microvolt.

Thermal contact to the crystals was made with indiumfaced copper clamps, four in all; one for the heater that supplied the temperature gradient, two for the thermocouple junctions that measured this gradient, and one to hold the crystal in contact with the gas thermometer bulb.

A temperature range of from 3 deg. K. to 30 deg. K. was covered, with liquid helium as the coolant. Temperatures below 4.2 deg. K., the normal helium boiling point, were obtained by pumping on the bath, and higher crystal temperatures were reached by allowing heat to flow through a thermal resistance between the crystal and the bath.

The resistivity of a crystal containing 1.5 mole % KBr and 98.5 mole % KCl was found to be less than that of KCl by a factor of 3.3. Pure KBr was found similar to pure KCl. From these results and calculations by Klemens, isotope scattering of phonons in KCl is estimated to account for only 5% of the observed thermal resistivity at low temperatures. The absolute magnitude of the

resistivity added by the Br⁻ ions was 1/3 as large as predicted by Klemens, but this is regarded as satisfactory agreement for the present state of refinement of the theory. The remainder of the resistivity, beyond that predicted for an ideal crystal, is probably caused by impurities.

With increasing KBr content, the thermal resistivity of a KCl-KBr mixed crystal was found to increase. A maximum was found in the vicinity of 50 mole % KBr, 50 mole % KCl; the resistivity there was approximately twenty times that of pure KCl. An attempt was made to extend Klemens' formula to the case of large impurity concentration, but the predicted variation of resistivity with composition was more steeply rising than the experimental curve.

All crystals measured — pure KCl, 1.5 mole % KBr, 9.5 mole % KBr, 28.3 mole % KBr, 49.1 mole % KBr, and pure KBr — showed the same dependence of resistivity on the temperature; minimum at 5 deg. K., increasing linearly with T for higher temperatures. The constancy of the position of the thermal resistivity minimum is interpreted as indicating a lack of clustering of Br or Cl ions. This conclusion agrees with X-ray and F-center evidence for the random distribution of these ions in a KCl-KBr mixed crystal. 100 pages. \$2.00. Mic 57-1047

1. P.G. Klemens, "The Scattering of Low Frequency Lattice Waves by Static Imperfections", Proc. Phys. Soc. A 68, 1113 (1955).

PHYSICS, ELECTRONICS AND ELECTRICITY

THE SIMILARITY PRINCIPLE AND ELECTRIC FIELD STRENGTHS IN HIGH-FREQUENCY GAS DISCHARGES

(Publication No. 20,239)

Maclin Schnelle Hall, Ph.D. The University of Wisconsin, 1957

Supervisor: Associate Professor J. G. Winans

The purpose of this study was to experimentally test the similarity principle for high-frequency gas discharges. High-frequency discharges in different discharge chambers should be "similar" to the extent that the electron energy distribution at corresponding points in space is the same if the quantities E/p, $E \wedge A$, and A/λ are the same. E is the rms electric field strength, p is the gas pressure, λ is the free space wave length of the alternating electric field, and Λ is the characteristic diffusion length of the discharge chamber. For a cylindrical discharge chamber, Λ is determined from the length, L, and the radius, r_0 , by the formula $1/\Lambda = \sqrt{(\pi/L)^2 + (2.405/r_0)^2}$. The similarity principle was tested by measuring breakdown and extinction electric field strengths in cylindrical Pyrex discharge tubes having different Λ but at frequencies such that Λ/λ was the same for all tubes. Then the values of the highfrequency ionization coefficient, $\zeta = 1/E^2\Lambda^2$, determined from these measurements and plotted as a function of E/pshould fall on the same curve for all discharge tubes if the similarity principle is valid.

The Pyrex discharge chamber being used was placed in the uniform field region of a tunable reentrant resonant cavity. Relative electric field strengths in the cavity were measured with a 9005 vacuum diode probe, which was calibrated in a slotted coaxial line shorted at one end.

The breakdown and extinction electric field strengths were measured as a function of pressure from .07 to 30 mm of Hg for each of the inert gases containing a small amount of mercury vapor and for pure neon. The measurements for the mercury-contaminated inert gases were taken at a frequency of 502 Mc/sec using a long cylindrical Pyrex tube for which Λ = .27 cm. The breakdown and extinction field strengths for pure neon were measured in three flat and two long Pyrex cylinders for which Λ = .430, .535, .619, .449, and .638 cm, respectively. The frequencies used were between 444 and 658 Mc/sec and chosen in each case such that Λ/λ = 9.44 x 10^{-3} .

The similarity principle was found to be valid for comparing the breakdown and extinction electric field strengths for pure neon for the frequencies and discharge tubes used in this experiment. However, the similarity principle failed to predict the observed breakdown E vs. p curve for He + Hg in a Pyrex discharge tube at 502 Mc/sec from breakdown field strength measurements made elsewhere at 3000 Mc/sec for He + Hg in a copper cavity. The similarity principle also failed to predict the observed breakdown field strengths for neon in a Pyrex discharge tube at 529 Mc/sec from breakdown field strength measurements made elsewhere at 2810 Mc/sec for neon in a copper cavity. These failures may have been due to differences either in the effect of wall charges or in the effect of electron-ion recombination. In spite of these failures, the similarity principle is useful for predicting approximate breakdown electric field strengths even for large changes in frequency.

An inflection was observed in the breakdown E vs. p curves at the gas pressure for which the electron mean free path is approximately one-half the characteristic diffusion length of the discharge chamber. It is suggested that elastic electron-wall collisions may provide a mechanism for the transfer of energy from the high-frequency electric field to the electrons at pressures lower than the mean-free-path limit of the diffusion theory for high-frequency breakdown and thus account for the observed inflection in the breakdown E vs. p curves.

122 pages. \$2.00. Mic 57-1048

THE LOW TEMPERATURE HALL EFFECT IN SINGLE CRYSTALS OF BERYLLIUM AND ZINC

(Publication No. 18,734)

Harold William Hemstreet, Jr., Ph.D. Louisiana State University, 1956

Supervisor: Professor Joseph M. Reynolds

An introductory discussion of the Hall effect is given, including a resumé of the modifications through which the theory has gone from its inception to the present. The recent observations of field dependent periodic oscillations in the low temperature Hall coefficients of bismuth,

graphite, and antimony are cited as the motivation for this work on beryllium at three crystallographic orientations and zinc at one. Detailed descriptions are given of the crystal growing method and the construction of the furnace and molds used. The Hall potential measuring circuitry is discussed. It incorporates several new variations to reduce extraneous potentials and decrease the error spread in the Hall data. The results are given in terms of a new coefficient characteristic of the Hall effect. They reveal no oscillations in the zinc specimen, nor in two of the three beryllium specimens. The results on the third beryllium crystal show uncertain aperiodic oscillations in the reciprocal of the magnetic field. Comparison of these results is made with another recent investigation of the low temperature Hall effect in zinc and beryllium.

99 pages. \$2.00. Mic 57-1049

A HIGH-ENERGY ELECTRONICS APPROACH TO THE GENERATION OF RADIATION AT MILLIMETER WAVELENGTHS

(Publication No. 19,869)

Murray Donald Sirkis, Ph.D. University of Illinois, 1956

A new method for the generation of relatively high powers at submillimeter wavelengths through the excitation of a single selected higher-order TM_{omn} mode in a cylindrical cavity is theoretically investigated by means of a field theory approach. Experiments at a wavelength of 8.310 millimeters which successfully demonstrate the method are described.

The oscillation in the higher-order mode cavity is excited by a high-energy (1 mev range), bunched electron beam, produced by a pulsed, single cavity electron accelerator which operates at a frequency of 2775 megacycles per second. The accelerator comprises a convergent beam injection tube which operates in the 20-25 kilovolt range and a cylindrical accelerating cavity, oscillating in the TM₀₁₀ mode, in which the accelerating fields are established by two RK5586 magnetrons operating in parallel. The electron beam produced by the accelerator contains current components at high harmonics of the 2775 megacycles per second fundamental frequency. The higher-order mode cylindrical cavity is designed to resonate in the desired mode at a particular one of these harmonics.

The diameter and length of a higher-order mode cylindrical cavity suitable for this application are typically of the order of several wavelengths. Such structures, resonant at wavelengths shorter than one millimeter, are therefore large enough to permit fabrication.

The theoretical analysis shows that effective coupling between the electron beam and the electromagnetic field within the higher-order mode cavity is possible only for electron velocities near the velocity of light. The theoretical relationships between the generated power $\mathcal P$ and the harmonic current component $\mathbf I_{\mathbf S}$ is typically of the order of

 $\mathcal{P}(\text{watts}) = 3000 [I_s (\text{amps})]^2 \sqrt{\lambda(\text{mm})}$

for a 1 mev electron beam. If a harmonic current

amplitude of 100 milliamperes (a reasonable value) is assumed, the theory predicts a pulsed generated power of approximately 30 watts at a wavelength of one millimeter.

The results of experimental power measurements are presented for five cavities. Three of these cavities were designed to operate in the TM_{018} mode and two in the TM_{028} mode. The operating wavelength was 8.310 millimeters, corresponding to the thirteenth harmonic of the fundamental accelerator frequency. The generated power was measured as a function of the electron beam velocity which was determined with the aid of a magnetic deflection electron spectoscope. The results of these experiments are in reasonable agreement with the theory.

A more refined form of the electron accelerator, which includes a prebunching cavity between the injection tube and the accelerating cavity, shows promise of producing an electron beam which has appreciable harmonic current components corresponding to wavelengths in the submillimeter range of the spectrum. If such a beam can be produced, it appears at this time that the principle of harmonic excitation of higher-order mode oscillations in resonant cavities can be used successfully to generate relatively high power at wavelengths shorter than one millimeter.

240 pages. \$3.10. Mic 57-1050

LUMINESCENT AND PHOTOCONDUCTING PROPERTIES OF CRYSTALLINE SILVER CHLORIDE

(Publication No. 20,430)

Donald Arthur Wiegand, Ph.D. Cornell University, 1956

In an effort to gain a better understanding of the luminescence and photoconducting processes and their possible interrelationship in silver chloride, several types of measurements pertaining to these two quantities have been similtaneously made on the same sample. In particular, the magnitudes and the decay mechanisms of the luminescence and photocurrent were investigated as a function of temperature between 4°K and 200°K, and as a function of several other parameters at 4°K and 77°K. With increasing temperature the luminescence intensity remains constant between 4°K and about 50°K, and then decreases with further increase in temperature. The photocurrent increases from 4°K to a maximum at about 60°K and then also decreases. While the temperature dependence of the luminescence intensity can be attributed to a single competing recombination process having a thermal activation energy of 0.05 e.v., but not accompanied by visable radiation, the temperature dependence of the photoconductivity is complex, and additional experiments are necessary to separate the effects of mobility, lifetime, and the efficiency of free charge generation.

The decay times are not monotonic functions of temperature. Maxima are observed that can be explained in terms of a model in which energy is transported from the site of absorption to the luminescence or recombination center by mobile holes and electrons. Delay in this energy transport is caused by hole and electron trapping and the temperature dependence of the delay mechanism determines the temperature dependence of the decay times.

At 77°K the luminescence and photocurrent decay times

have been found to be a function of previous heat treatment. Annealing in vacuum increases both decay times by roughly a factor of ten, but the decay times are decreased immediately after annealing in a chlorine atmosphere. The effects of chlorine annealing are transient so that the decay times eventually approach those found after vacuum annealing.

One of the objectives of this investigation was to determine if there is a relationship between the luminescence and photoconductivity of this material. The temperature dependence of the luminescence intensity, the temperature dependence of the luminescence and photocurrent decay times, the magnitude of both decay times, and the dependence of both decay times on annealing can all be interpreted in terms of a model in which luminescence results from the capture of a free charge. The relative magnitudes of the luminescence and photocurrent decay times and the fact that the major portion of the photoconductivity is due to electron motion indicate further that luminescence occurs when a free hole is captured. The dependence of the decay times on annealing is consistent with the hypotheses that recombination resulting in luminescence occurs at silver ion vacancies.

In conjunction with the photocurrent experiments the change in dielectric constant with irradiation was investigated. A relaxation-type dispersion was found in the kilocycle frequency range which is a function of several parameters such as intensity of irradiation, temperature and voltage. This dispersion can be explained, at least in a qualitative manner, by a space charge model in which the electrodes are blocking and in which only one sign of charge carrier is mobile.

222 pages. \$2.90. Mic 57-1051

AUGER EFFECTS IN METALS

(Publication No. 19,976)

Otto Henry Zinke, Ph.D. Washington University, 1956

Chairman: Robert N. Varney

The enormous complexities of secondary electron spectra, induced by primary electron bombardment, have been studied with a view to eliminating, step by step, the assortment of effects arising from uncontrolled variable factors in the experimental techniques. At the same time, data were amassed to show the nature of the secondary spectra under various conditions of surface treatment and various operating conditions, both for practical information and for future analysis as better understanding of surface develops. It is believed that at least one experiment was completed with all variables under control, and the excellent correlation between theory and the results of this experiment lend encouragement to the view. The extremes of effort which were necessary to achieve the pure metal result pointed to termination of the present attack in favor of drastically new procedures, but not before the ultimate success of the entire project, theoretical correlation, and fundamental interest in the results had been assured.

137 pages. \$2.00. Mic 57-1052

PHYSICS, METEOROLOGY

THE GENERATION AND PROPAGATION OF SHORT CRESTED GAUSSIAN WAVES IN A MOVING FETCH

(Publication No. 18,066)

Lloyd S. Simpson, Ph.D. New York University, 1956

Adviser: Professor W. J. Pierson

Based on the theoretical considerations of energy flux and the theoretical spectrum of Neumann [5], formulas for the properties of waves generated in moving fetches are derived and examples of their use are given. It is shown that the waves generated by fetches moving in the same direction as the wind have a steeper energy gradient throughout the front of the fetch than do the waves generated by fetches that move opposite to the wind. The chance of a fully developed sea occurring in the former fetch is shown to be considerably greater than in the latter fetch.

It is also shown that for wind blowing toward the coast at an angle to the direction of propagation of the fetch, the wave system can be projected onto the coast if the fetch velocity and the group velocity of the various wave components are known. In this way the state of the sea along the coast can be computed. 66 pages. \$2.00. Mic 57-1053

PHYSICS, NUCLEAR

THE INFLUENCE OF RADIATION DAMAGE ON THE POSITRON ANNIHILATION LIFETIME IN HIGH-POLYMER PLASTICS

(Publication No. 20, 176)

John Alexander Bjorkland, Ph.D. North Carolina State College, 1956

Supervisor: Arthur Clayton Menius, Jr.

Measurements have been made of the positron decay times in the five plastics, lucite, nylon, polystyrene, polyethylene and Teflon, both for the unirradiated plastic and for samples that were irradiated in the Brookhaven reactor with up to 10¹⁸ NVT of slow neutrons and 10¹⁷ NVT of fast neutrons. For the plastics lucite, nylon, polyethylene and polystyrene, the resultant radiation damage had little effect on the positron decay curves. For the Teflon the decay times were not altered but the intensities of the two components were changed with the long lived component being reduced from 23% to 8.5% of the total.

This is thought to be caused by the heterogeneous nature of the radiation damage in the Teflon. An upper limit of 10⁻⁵ cm is postulated for the diffusion length of positronium atoms after they are formed.

A detailed description of a complete system for millimicrosecond coincidence work is described.

78 pages. \$2.00. Mic 57-1054

NUCLEON-NUCLEAR WALL INTERACTION IN SCATTERING PROCESSES

(Publication No. 20,112)

David Marion Chase, Ph.D. Princeton University, 1955

A one-dimensional analogue is considered for the system of nucleon and deformable nuclear field with associated dynamic nuclear wall envisaged in the collective model. Conventional and Green's function (below termed Bohr-Mottelson or B-M) expansions of the wave function for the system, with a linear-in-deformation approximation to the interaction assumed, and an expansion based on adiabatic nucleonic wave functions are employed to formulate the determination of energy levels. Equivalent expressions for the eigenenergies in the limit of weak coupling and adiabatic particle motion are obtained by the three methods. The approximate, linear, &-function interaction leads to an unnormalizable wave function when a certain parameter of the system exceeds 1. In this event the B-M expansion method yields no meaningful eigenenergies.

The coupling between nucleonic and wall motions provides a mechanism for energy exchange in scattering processes. The relevant cross sections for the one-dimensional model are given first in a distorted wave Born approximation. Expressions for cross sections are derived also in the B-M formulation. Resonances occur through quasi-bound intermediate states in which the nucleon occupies a bound level. The variation with energy of the height of resonances is controlled by the single-particle structure.

An adiabatic approximation is developed for calculating cross sections for scattering of particles when the period of motion of the target is large compared with the time required for the incident particle to cross the region of interaction. This approximation reduces the problem of determining inelastic cross sections to one of obtaining the elastic scattering amplitude as a function of the instantaneous target coordinates and evaluating its matrix elements between initial and final states of the target. Resonances are not obtained by this method.

Results of numerical calculations of cross sections in the one-dimensional model by the Born, B-M, and adiabatic methods are presented. The B-M method is found to yield results fairly independent of the number of wall states considered provided that this number is sufficient to allow the single-particle structure to effect a cutoff. For coupling strengths of interest, the energy dependence of the cross sections is dominated by the resonance structure. The Born approximation is completely inadequate for such coupling strengths. As calculated by the adiabatic approximation, the total inelastic cross section does not increase monotonically with coupling strength. Average reduced total inelastic cross sections of the order of 5 or 10% are obtained with reasonable coupling.

The calculation of cross sections for scattering of neutrons by a target nucleus whose excited levels are considered to be of pure incompressive, second order, surface oscillational character is formulated in the Born approximation and by the B-M method with the spin of the incident neutron omitted.

The calculation of cross sections for scattering of neutrons by a strongly deformed target nucleus is also

formulated in the Born approximation and by the B-M method, and for excitation of levels within a single rotational band the calculation is formulated by the adiabatic method without the approximation of the linear, &-function interaction. In the approximation in which states of the target nucleus are represented by adiabatic, strong coupling wave functions, no excitation of individual-particle levels of the target by the incident neutron is possible, but rather only vibrational and rotational excitation. A method is given for calculating the amplitude for elastic scattering by a non-spherical but rotationally symmetric square well, this being needed for the adiabatic approximation. A method based on employment of spherical coordinates is also given; choice of a somewhat anomalous potential renders the Schrödinger equation separable. A classical treatment of rotational excitation is also formu-172 pages. \$2.25. Mic 57-1055 lated.

THE NUCLEAR DISINTEGRATIONS OF As⁷¹ AND Te¹²⁹ (Publication No. 17,952)

William Ewing Graves, Ph.D. Indiana University, 1956

The disintegrations of As⁷¹ and Te¹²⁹ have been investigated with the help of magnetic lens spectrometers, a 180° shaped-field magnetic spectrometer, a permanent field magnetic spectrometer with photographic recording, scintillation spectrometers, and coincidence equipment.

As71, formed by the deuteron bombardment of separated Ge70, decays by positron emission and orbital electron capture to Ge^{71} . The half-life was found to be 62 ± 3 hours. Two gamma-rays are emitted whose energies are 175.0 \pm 0.3 Kev and 23.00 \pm 0.05 Kev. Internal conversion lines from both gamma-rays were observed. Only the 175 Kev line was observed with NaI (Tl) crystals, indicating a very high internal conversion coefficient for the 23 Kev line. By means of coincidence techniques, it was determined that the state at 175 Kev has a half-life of approximately 0.07 x 10⁻⁶ sec. This fact, together with the measured internal conversion coefficient of the 175 Kev line (α K = 0.095), indicates that the 175 Kev radiation is of E2 character. The 175 Kev transition is estimated as being about 100 times as intense as the 23 Kev transition. The end-point of the positron spectrum was found to be 815 ± 10 Kev, giving a value of log ft = 5.73. A linear Fermi plot, together with the log ft value, indicates an allowed transition. A tentative decay scheme for As⁷¹ is proposed, based on the experimental evidence and shell model considerations.

Te¹²⁹, formed by the deuteron bombardment of separated Te¹²⁸, decays by negatron emission to I¹²⁹. The half-lives of the isomeric states in the parent were found to be 41 days and 74 minutes. The 74 minute state decays to I¹²⁹ under the emission of beta-ray groups whose end point energies and relative abundances are 1.453 Mev (71 percent), 0.989 Mev (15 percent), 0.69 Mev (4 percent), and 0.29 Mev (10 percent). As a result of low counting rates and many subtractions of data, the last two groups in particular are not very precise. Gamma rays of 0.027, 0.212, 0.475, 0.728, and 1.12 Mev were found. Of these, only the 27 Kev line was internally converted to an observable

degree. The 41 day state decays, for the most part, to the 74 minute state of Te¹²⁹ with the emission of a highly internally converted gamma-ray of energy 106.3 ± 0.1 Kev for which the K/L ratio is unity. A beta-ray transition, of low intensity, from the 41 day state of Te¹²⁹ to the ground state of the product is postulated. Gamma-Gamma coincidence experiments using scintillation spectrometers indicated that there were coincidences between (0.027 -0.475), (0.027 - 1.12), and (0.475 - 0.212) Mev gammarays, but no coincidences between (0.027 - 0.728), (0.475 -1.12), or (0.728 - 1.12) Mev gamma-rays. Beta - Gamma coincidence experiments were performed in order to determine the beta groups in coincidence with the 0.027, 0.475, 0.728, and 1.12 Mev gamma-rays. The results were in rather good agreement with the four groups obtained with the magnetic lens spectrometer. The probable level scheme of I129 was constructed from the data mentioned. A discussion of the disintegration scheme is given suggesting probable spins and parities of the levels.

65 pages. \$2.00. Mic 57-1056

POSITRON LIFETIME IN PLASTICS AS A FUNCTION OF TEMPERATURE

(Publication No. 20,182)

Joseph Gideon Lundholm, Jr., Ph.D. North Carolina State College, 1956

Supervisor: Arthur Clayton Menius, Jr.

The positron long lifetime component in five different plastics (Lucite, Nylon, Polyethylene, Polystyrene, and Teflon) was studied as a function of temperature from 25°C to 200°C. using a millimicrosecond coincidence system with a resolving time on the order of 1.0 millimicrosecond. Na²² positron source and plastic samples were placed in a silicone oil bath furnace located between two photomultipliers with plastic scintillation phosphors and positron lifetime measurements were made at temperatures up to 200°C. A special automatic programming circuit employing motor driven coaxial switches to insert the desired sequence of lengths of delay line in the two coincidence channels to obtain the coincidence curve was designed for this experiment. The main problems in the coincidence system were due to errors in the data caused by the temperature sensitivity of photomultipliers, scintillation phosphors, and the germanium diode in the fast coincidence circuit. It was necessary to maintain them at nearly constant temperature.

The result of the influence of temperature between 30° and 200°C on the long lifetime component of the positron mean life in the five plastics indicates that the lifetime varies more nearly in proportion to the absolute temperature than to the square root of the absolute temperature.

At the present time, it is not possible to give a definite theory for the temperature effect. It is difficult to see how the slight change in average energy of the thermalized positron from approximately 0.025 ev at 30°C to 0.039 ev at 200°C could account for the experimental results. It is also difficult to correlate the observed increase in lifetime with the 4 to 8 per cent increase in the volume of the plastics as the temperature increases from 30°C to 200°C.

After the short time interval which is required for the thermalization of the positron, its velocity should vary as the square root of the absolute temperature. If the cross section for the probability of conversion from the triplet to the singlet state is velocity dependent in the same manner as the cross section for the absorption of a thermal neutron, that is 1/v, then the lifetime should be expected to increase in proportion to the square root of the absolute temperature. This effect, if it exists, will not completely explain the experimental results although it is in the proper direction.

78 pages. \$2.00. Mic 57-1057

BETA AND GAMMA SPECTRA OF YTTRIUM-88 AND RHODIUM-102

(Publication No. 19,975)

William Leake Stirling, Ph.D. Washington University, 1956

Chairman: Dr. Norman Goldberg

A brief review of the theory of operation of a double focusing spectrometer is presented followed by a discussion of absolute intensity measurements. The essentials of the Fermi theory of beta decay are discussed including an extension to forbidden transitions, spectral shapes, and log ft values.

A detailed discussion is given of the modifications necessary to make the spectrometer capable of operating as a beta-gamma coincidence spectrometer. This is followed by performance tests to illustrate the operation of the coincidence assembly.

The literature on Y-88 is reviewed. One positron distribution of 830 Kev end point energy is verified, and it is shown that the distribution has no known shape. It is believed that about 30 to 50 per cent of the experimental distribution is composed of positrons from internal pair conversion of the 1.85 Mev gamma-ray, and that the remaining is composed of positrons from the decay of Y-88 with an energy maximum of about 600 Kev — a first forbidden "unique" transition.

A survey of the literature on Rh-102 is presented. It is found that the previously reported activities assigned to Rh-102 belong to two, and possibly three, rhodium isotopes. It is further shown that the Rh-102 half-life is 98 ± 20 days and not 210 days. The results are as follows:

Rh < 102; 5y half-life, known to have 128 Kev and 198 Kev gamma-rays. It is believed to have three positron groups of 200 \pm 40 Kev, 870 \pm 20 Kev, and 1340 \pm 10 Kev end point energies and one electron group of 1190 \pm 10 Kev. Rh-102; 98 \pm 20d half-life, believed to have gamma-rays of 475 Kev, 630 Kev, 698 Kev, 728 Kev, and 1070 Kev. It is questionable whether an observed 560 Kev gamma-ray belongs to Rh-102. One positron group of 400 \pm 30 Kev is found, and the negatron activity is questionable.

136 pages. \$2.00. Mic 57-1058

PHYSIOLOGY

THE INFLUENCE OF OXYTOCIN AND EPINEPHRINE UPON UTERINE MOTILITY AND METABOLISM

(Publication No. 19,835)

Mario Anthony Inchiosa, Jr., Ph.D. University of Illinois, 1956

An attempt was made in these investigations to obtain information upon the metabolic actions of the hormones oxytocin and epinephrine in causing their specific effects upon uterine motility.

Manometric and muscle lever experiments with uterine tissue, and enzymatic studies with crude muscle extracts and purified muscle proteins from the myometrium were employed in attempts to associate oxytocin and epinephrine with the energy metabolism of uterine muscle.

Oxytocin was not observed to exert any specific effect upon the respiration rate of rat uterine slices or upon the adenosine triphosphatase (ATPase) activity of crude uterine muscle extracts from the rabbit or the cow. Using muscle lever techniques with rabbit uteri, oxytocin was found capable of reversing the inhibitory action of reducing substances upon uterine motility and it was also observed that the response of uterine muscle to oxytocin under anaerobic conditions appeared to be relatively greater than the response under aerobic conditions.

In muscle lever studies it was found that a sudden

change from aerobic to anaerobic conditions resulted in a complete inhibition of motility in rabbit uteri and a temporary loss of responsiveness to oxytocin. One possible explanation for these results might be that under aerobic conditions, energy (ATP) was being utilized for muscular contraction almost as rapidly as it was being synthesized. With a sudden change to anaerobic conditions, a sufficient energy store may not have been immediately available for muscular contraction since anaerobic generation of ATP is much less efficient than aerobic generation.

Epinephrine was found capable of stimulating the rate of accumulation of inorganic phosphorus in crude uterine muscle extracts in the presence of ATP (presumably an increase in ATPase activity). The increase with epinephrine amounted to 27%. This increase was significant (p

= < 0.05) and compared favorably with a significant (p = < 0.01) increase of 34% in the rate of acid production of a similar crude uterine extract in the presence of ATP as a result of epinephrine treatment. The rate of acid production in the presence of ATP was used as a second method of attempting to assay ATPase activity.

Epinephrine was also found to influence the ATPase activity of purified preparations of actomyosin, the contractile protein of muscle. The ATPase activity of actomyosin is generally believed to be of major importance in the mechanism of muscular contraction. In the presence of relatively high concentrations of KCl (0.5 M), samples

which contained epinephrine at a concentration of 6 x 10^{-5} M demonstrated 78.1% as much ATPase activity as control samples. This decrease was statistically significant (p = < 0.02). In the presence of a relatively low KCl concentration (0.02 M) plus CaCl₂ at 0.008 M, samples treated with epinephrine at 6 x 10^{-5} M demonstrated 96.1% of the ATPase activity of the controls. This decrease was also statistically significant (p = < 0.05). With concentrations of KCl: 0.02 M, CaCl₂: 0.008 M, and MgCl₂: 0.002 M, samples treated with epinephrine at 6 x 10^{-5} M showed a 2.3% increase in ATPase activity. It was also observed that in the presence of only potassium ions, increasing concentrations of epinephrine produced progressively greater decreases in ATPase activity, but with the addition of calcium ions, the reverse situation was noted.

The type and concentration of inorganic ions present appeared to influence the nature of the response of actomyosin ATPase activity to epinephrine treatment. In consideration of these results, speculation might be raised as to the importance of the type and concentration of inorganic ions present in various smooth muscle sources in the body in regard to their specific physiological response (stimulatory or inhibitory) to epinephrine.

80 pages. \$2.00. Mic 57-1059

PERMEABILITY AND UTILIZATION OF GLUCOSE IN MAMMALIAN ERYTHROCYTES

(Publication No. 20,130)

Philip Charles Laris, Ph.D. Princeton University, 1956

The rate of glucose utilization by erythrocytes of several mammalian species was determined at 37° C in the presence of various glucose concentrations. When no glucose was added to the bloods, the initial rates determined were such that rat > dog > rabbit > man > guinea pig > sheep > beef > pig. No increases in the initial rate of glucose utilization were observed when the glucose concentration of these bloods was increased from 100 to 500 mg. /100 cc. whole blood.

The disappearance of glucose from the plasma of these bloods was also studied as a function of glucose concentration. With rat, rabbit, dog, guinea pig, and pig bloods, the loss of glucose from the plasma increased as the glucose concentrations were raised. On the other hand, plasma glucose losses in sheep and beef bloods were independent of the blood glucose concentration.

Sheep and beef erythrocytes contained no glucose initially and remained "glucose-free" when incubated with increased amounts of glucose for as long as 20 hours. The cellular glucose concentration of the erythrocytes of the other species studied did increase when glucose was added to their plasma. When the initial glucose concentration was 500 mg./100 cc. of whole blood the rate of increase of cellular glucose concentration showed the following order: rat > rabbit > dog, guinea pig > pig. For this reason and others discussed, this order was judged to be the order of permeability for glucose of these erythrocytes — while sheep and beef are apparently impermeable.

Metabolic inhibtors, mono-iodoacetic acid and sodium fluoride were used to study glucose permeability in the

absence of glucose utilization. Marked species differences in the amounts of these compounds necessary to produce inhibition were observed. While glucose utilization was inhibited with IAA or NaF, glucose losses from the plasma were one-third or less with sheep and beef bloods and one-half or more with rabbit, rat, and guinea pig bloods than those recorded when no inhibitor was added. These results indicated that metabolic processes might be responsible for the movement of glucose into the sheep or beef erythrocyte but not into those of the rat, rabbit, or guinea pig.

The influence of phloridzin on glucose movements in rat and rabbit bloods was investigated. Glucose losses from the plasmas of rabbit and rat bloods were smaller in the presence of .004M phloridzin than those recorded in the absence of this compound. Glucose utilization and pH changes were not different from the controls at this concentration of phloridzin. The erythrocytes in the bloods containing phloridzin did not undergo the same volume changes observed in the control cells. The mechanism of the lowered glucose uptake or the volume influence produced by phloridzin is not known.

Because of the complexity of the system, i.e., rates of glucose utilization which decrease with time and cellular volume changes resulting from the production of acid by the cells, it was not possible to determine the permeability constants for glucose of the cells investigated. But an order of permeability for these cells, previously unknown, was determined.

92 pages. \$2.00. Mic 57-1060

AN EXPERIMENTAL STUDY OF SOME OF THE FACTORS INVOLVED IN TOURNIQUET SHOCK IN RATS

(Publication No. 20,131)

Stephen J. Le Brie, Ph.D. Princeton University, 1956

The application of tourniquets to both hind limbs of the anesthetized rat for periods of 5 or 6 hours initiates upon the release of the constrictions, a typical shock-like state which usually terminates in the death of the animal. The common physiological changes associated with this syndrome include, hemoconcentration, marked diminution of blood volume, vasoconstriction, lowered body temperature, eventuating in circulatory collapse and death.

The 100% mortality found in the controls is not caused by bacterial invasion of the rat's tissues and release of toxins as claimed by Fine and his co-workers. Of 100 bacterial cultures of swollen and edematous leg tissue prepared at the time of death, only 3 contaminated tubes were found. These cultures also included besides samples of both leg muscles, liver, spleen and heart blood. It was found, however, that bacterial invasion of these tissues does occur, as might be expected, between 2 and 10 hours after the death of the animal from shock.

Cultures of leg tissue taken 24 hours after sublethal (2 hour) tourniquet application, were uniformly negative. Of the cultures taken 48 hours after sublethal constrictions were applied, only one tube exhibited growth.

Three applications of sublethal tourniquets, at intervals of one week, protected a surprising number (87%) of the animals when they were later tested against the lethal

effects of 6 hour tourniquets. Seventeen of the 19 rats surviving the 3 sublethal and one 6 hour tourniquet application, also survived a second lethal constriction when it was applied a week later.

Prophylactic foretreatment with histamine so that each animal received a total of 1315 mg over a 10 day period, was almost as effective as sublethal constrictions in preventing death after 6 hour tourniquets since 61% of the animals survived.

Foretreatment with formaldehyde administered in the same manner as the histamine proved to be ineffective; as did muscle trauma applied to both hind legs at various times before tourniquet application.

When animals were adapted to anoxia by clamping off the aorta and vena cava for 10 hour periods a significant number (64%) of the rats survived. It was found that the animals were not subjected to complete anoxia of their limbs during these 10 hour periods, since a large collateral circulation is present. The primary factor in inducing the fatal outcome from tourniquet shock seems to be the greatly depleted blood volume, caused by local loss of fluid into the injured limbs. However, other factors such as toxins, deleterious tissue metabolites, anoxia, etc., which by themselves are probably incapable of inducing symptoms in a normal animal, may, when superimposed on an animal already weakened by low arterial pressure, and reduced volume of circulating fluid, be sufficient to destroy the individual.

The results of the present experimental study indicate that rats can be conditioned by repeated exposure to certain of these factors so that marked tolerance develops to leg constrictions and a large number of the animals survive a procedure which is usually fatal.

86 pages. \$2.00. Mic 57-1061

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

TRUJILLO'S DOMINICAN REPUBLIC: A CASE STUDY OF LATIN AMERICAN DICTATORSHIP

(Publication No. 20,090)
Jesús de Galíndez, Ph.D.
Columbia University, 1956

This thesis begins with a general discussion of the difference between the meaning of dictatorship and tyranny and comes to the conclusion that the Dominican government falls within the latter denomination because it is unrestrained by public law. The Trujillo administration is identified with such historical Latin American governments as those of Diaz in Mexico and Gomez in Venezuela. The first part of the thesis is a detailed historical summary of the major political events in Santo Domingo beginning with 1930. Opening with a short biography of Rafael L. Trujillo, this part of the thesis describes the political coup of 1930 by which he first came to power and goes over the events that led to the fixing of Trujillo's hold upon the government of Santo Domingo. The political coup of 1930 was followed by the very short provisional government of Estrella Ureña to allow for an election of Trujillo for the term of 1930-1934. He was again elected for the term 1934-1938. The massacre of some 12,000 Haitians in 1938 stirred opposition abroad and forced Trujillo to allow the formal election of Peynado for the 1938-1942 period. Peynado did not complete his term and was replaced in 1940 by Troncoso. But Trujillo kept control of the administration from his position as chief of staff of the army. He again became president for the term 1942-1947, and for the years 1947-1952. In 1952 Trujillo had himself replaced by his brother Hector H.

Following the record of historical events, the second part of the thesis analyzes the Trujillo regime. The administration operates through the device of a single party of which Trujillo is president. All other political parties have been proscribed, except when upon occasion a simulated opposition is brought into being for a special purpose. All appointed and elected officials deposit a signed but undated resignation with the president of the party who fills in the date and presents the resignation when it suits his convenience. This places all public officials, appointed or elected, at his mercy. The government seemingly operates within a classical constitution with the customary separation of powers, bill of rights, regular elections and well nigh universal suffrage. But within this constitutional frame the power of the president is unlimited, and the law has been turned into a pliant instrument of his will. As president of the single political party, he controls all nominations, and has arranged matters so that all elections for all offices are by 100 per cent of the registered voters. By having in his posession the unsigned resignations of all officials -- including the members of congress, the senate, and supreme court -- he changes the membership of these bodies at will. There are almost innumerable

instances of men elected for two or four years who only serve a few months, to be replaced by others chosen from a list presented by the president of the party. There are also numerous instances of congressional districts entitled to two representatives in congress that by repeated resignations were represented by six, eight, ten, and twelve different congressmen during this same two or four year period. A similar method is applied to the courts. This has made all law and all public administration completely pliant to the will of the president of the party who is also president of the country. It has also created a system of complete personal insecurity, and public officials do not know from day to day what fortune awaits them. The law is changed to satisfy the caprice of the ruler of the country. And property, taxes, business operations, as well as personal freedom are at the mercy of a legal system which has become an instrument of personal tyranny and family aggrandizement.

The Trujillo regime is not a bloody one when compared to some other Latin American tyrannies. It also has to its credit a very considerable record of economic improvement. It is notable as a contemporary tyranny without any claims to ideological justification, where the objectives are clearly personal power and wealth, where megalomania (the titles and decorations fill an entire chapter), and nepotism (members of the family occupy nearly all important military, political and civil offices and control a great part of the economy) seem sufficient ends in themselves, and where the use of personal insecurity and fear rather than violence is the major tool of political domination.

703 pages. \$8.90. Mic 57-1062

THE LIBERAL PARTY IN NEW YORK STATE

(Publication No. 20,115)

Houston Irvine Flournoy, Ph.D. Princeton University, 1956

The domination of the American political scene by two major parties has often tended to obscure the fact that third parties have played a continuing, and often important, role in the development of this country. Despite numerous legal and organizational obstacles, there has usually been at least one minor party on the ballot at any given general election.

At the present time, only the Liberal party in New York State remains as a continuing third party with any significance in the determination of political affairs. However, instead of nominating independent candidates, the Liberals have operated to gain influence and success through the endorsement of major party candidates—primarily those of the Democratic party. With an enrollment of about 100,000, but a total vote approximating 5% of the state's voters, their independent successes have been very limited, and restricted to conditions of exceptional circumstance.

Through the beneficience of the state's election law, which permits multiple endorsements, the Liberal party has been able to acquire a power and importance in the state's political affairs without the usual concommittant necessity of gaining power through the election of their own candidates. Due to the relative positions of the major parties within the state, the Democratic party has been dependent upon the endorsement of the Liberal party in order to carry the state for Democratic nominees. As a result, the Liberals have been able to exert an influence over the Democratic party's nominations.

Yet, fundamentally, it has not been the election law alone which has made this type of operation possible and profitable. The Liberals have been fortunate in having the support of the International Ladies Garment Workers Union, under the leadership of David Dubinsky, the United Hat, Cap, and Millinery Workers Union, under Alex Rose, and various other less important unions. Through these unions, the party has been blessed with a continuing organization which has been able to provide the party with the necessary personnel and financial support to sustain it in the absence of the traditional attractions for political finances and support. Furthermore, the party has inherited through these unions much of the former support of the Socialist party in New York City. Within the city, the staunchest groups which earlier supported the Socialist party were the Jewish immigrant groups concentrated within the needles trades. With their devotion to independent political action, they brought to the Liberal party a core of supporters who generally disregarded the requirement of personal reward for political participation.

As the party has not achieved prominence in the sphere of independent nominations, its importance stems from the power that it has exerted upon the Democratic party, through which the Liberals are ideologically tied to the New Deal. In these operations the party has, at one time or another, importantly aided the present liberal leadership of the Democratic party. Each of the leading figures of the Democratic party-Wagner, Jr., Harriman, Lehman, F.D.R., Jr., and DeSapio-have, at least to some extent, been elevated in the Democratic party through Liberal influence and actions.

The conditions which have sustained the Liberal party are for the most part peculiar to the New York City political environment. Their duplication elsewhere is not likely, and it would be improbable that other parties would be successful in similar minor party operation. In fact, as the composition of the I.L.G.W.U. changes, as the older former socialists disappear, and as the New York Democratic party assumes a cleaner and more liberal disposition, the conditions which have sustained the Liberal party are rapidly disintegrating. 267 pages. \$3.45. Mic 57-1063

FOUNDATIONS OF ENGLISH CONSTITUTIONAL THEORY: AN INTERPRETATION OF THE RELATION BETWEEN POLITICAL PHILOSOPHY AND CONSTITUTIONAL THEORY IN MODERN ENGLAND

(Publication No. 20,116)

Edwin Fogelman, Ph.D. Princeton University, 1956

An examination of the constitutional theories of representative English constitutional thinkers during the last three centuries -- Blackstone in the eighteenth century, Dicey in the nineteenth, and Jennings in the present century--reveals that in each case the constitutional theory depends upon and reflects a particular political philosophy. Throughout most of the modern period, the concept of constitutionalism embodied in English constitutional theory derived from a postulated antithesis, systematically elaborated by Hobbes, between the individual subject and the sovereign. This antithesis is rooted in the philosophy of Hobbes and culminates, in his writings, in the concept of individual liberty. The dilemma posed by Hobbes' simultaneous defense on the one hand of the absolute inviolability of human life, based on an appeal to the law of nature, and on the other hand of the unlimited power of the sovereign, based on the necessity to maintain public order, represents the recurrent problem for all the most important English constitutional theorists until the twentieth century.

The absence of judicial review imposed a severe handicap on Blackstone and Dicey, both of whom saw in the defense of private rights the principal objective of a constitutional order. Their solution was first to emphasize the practical supremacy of the judiciary as the repository of the rule of law, notwithstanding the doctrine of parliamentary sovereignty, and second to insist on maintenance of institutional arrangements designed to insure that the actual power of Parliament could be exercised only with the concurrence of the conservative elements represented in the House of Lords. In the nineteenth century two developments added a new dimension to the issues dealt with by Blackstone. The first was the extension of rights against government to include economic rights, and notably freedom of contract, and the second was the development of the House of Commons into a popularly elected assembly increasingly devoted to the promotion of welfare measures. For Dicey, free contract was simply an extension of traditional English liberties, and he perceived in the changing attitude of the Commons a fundamental difference in social philsophy. He was unable to reconcile the implications of this new collectivism with his concept of constitutionalism.

Before Dicey's constitutional principles could be abandoned, it was necessary first to refute the antithesis between the individual and the sovereign, and second to find some other goal besides maintenance of the rule of law as the object of the constitutional order. T. H. Green showed the way to both achievements. Building implicitly on the philosophic foundations supplied by Green, Jennings in the twentieth century has rejected the Diceyan concept of constitutionalism and has dismissed as irrelevant the dilemma posed by Hobbes.

The meaning of constitutionalism, then, as reflected in modern English constitutional theory, has undergone a profound change. It has changed from a concept based on an abiding antithesis between the individual, with his interests and his rights, on one hand and the state with its great and always dangerous power on the other, to a concept based on the consideration that the primary responsibility of citizenship is participation in the life of the state, and the primary responsibility of the state is to contribute to the well-being of the citizen. The definition of constitutionalism must take into account that not individual liberty but social justice underlies the workings of a constitutional system in the twentieth century.

390 Pages. \$5.00. Mic 57-1064

AMERICAN ZIONISM: THE BUILDING OF A POLITICAL INTEREST GROUP

(Publication No. 19,974)

Samuel Halperin, Ph.D. Washington University, 1956

Chairman: Associate Professor William N. Chambers

The general <u>objective</u> of this study is the formulation and testing of new or prevailing hypotheses concerned with the relations between an interest group and its potential supporters, or "public," and with the expansion of the interest group's influence among that "public." Specifically, the inquiry traces and analyzes the development of the American Zionist movement between 1930 and 1946 as an extensive case study, from which an attempt is made to derive hypotheses which may be relevant to the pattern of development of interest groups in general.

Primary attention is given, not to the Zionist organizations and their internal affairs but, rather, to the American Jewish community as a whole. This broadening of the scope of the inquiry was a direct consequence of a primary orienting hypothesis, namely, that the changing character and influence of an interest group cannot be accounted for without a consideration of developments within the interest group's "public"—those groups and individuals which the interest group seeks to influence and convert into group members and supporters.

The principal technique employed is documentary analysis. An effort is made to trace the gradual acceptance of Zionist objectives in various sectors of the American Jewish community, as indicated by convention resolutions, proclamation, funds raised for Palestine, and other actions related to Palestine. Attention is given not only to the activities of Zionist groups and leaders, but also to the activities of Zionist partisans who were simultaneously members of Zionist "target groups," the influence of world events on the opinions of American Jews, the effects of socio-economic situation and of psychological predispositions among members of the American Jewish community on the initial reception accorded to Zionist demands, the role of the total American society in conditioning sub-group values, and the nature of Zionist propaganda aimed at uncommitted and at hostile sectors of the American Jewish community.

The primary data of the study are derived from historical materials, that is, yearbooks, convention proceedings, inter-office communications, correspondences, autobiographies and the official press of a large number of Jewish organizations and individuals. Public opinion polls and statistical tables are introduced where available. Substantive

works in political science and in other social sciences are also consulted for hypotheses and insights relevant to the inquiry.

The results indicate that, by 1946, the American Zionist movement had grown from a comparatively inconsequential interest group to a coalition of Jewish groups and individuals drawn from every sector of the American Jewish community. On the basis of this relatively widespread Jewish acceptance of their goals, Zionist groups and leaders were enabled with the passage of time to operate from an improved power and influence base vis-a-vis the American government.

The general <u>conclusions</u> of this case study are contained in approximately two dozen general hypotheses which help account for the growth of the American Zionist movement and which, it is hoped, may be of value to future investigations in the area of interest group politics.

535 Pages. \$6.80. Mic 57-1065

THE LIBERAL PARTY OF CANADA

(Publication No. 20,242)

Paul Harry Heppe, Ph.D. The University of Wisconsin, 1957

Supervisor: Professor David Fellman

The construction and maintenance of a political party in Canada is complicated by the complex environment in which it must operate. Nevertheless, the Liberal party has dominated the national arena for most of the twentieth century and continuously since 1935.

How has the Liberal party been able to secure and maintain a national power monopoly in the face of Canada's diversity? If the Liberal party must develop a program which appeals to diverse interests, are the results necessarily opportunistic, inconsistent and devoid of principles?

A valid analysis cannot be limited to the pronouncements of Liberal leaders. Resolutions adopted by party organizations will not complete the picture. One must also study the legislation passed under Liberal auspices. Statements of principles and policies must be studied in association with the legislative action of successive Liberal Governments.

To maintain a national appeal the Liberal party has stated its principles in general terms. This same consideration has caused the Liberal party to take a curving, hesitant course, rather than to rush toward its goals. Positive action is ordinarily postponed until the party leadership is convinced that a majority of the people are in accord with the proposed action.

Party leadership is an important factor in Canada. The national leader must develop the formula to attract and hold competing interests. The Liberal party has had unparalleled success in its national leaders. Since 1887, it has had only three leaders, Wilfrid Laurier, Mackenzie King and Louis St. Laurent. While Wilfrid Laurier made a genuine national party out of scattered Liberal factions, the dominant twentieth century influence on the party has been Mackenzie King.

Mr. King has shaped Canadian Liberalism and the Liberal party. Nineteenth century Canadian Liberalism

was based on classical Manchester Liberalism, but Mackenzie King led Canadian Liberalism away from economic laissez faire and over toward a social welfare state. In his celebrated book, Industry and Humanity, he developed the thesis that a natural harmony would not develop out of a competition of economic interests. He concluded that political authority should be employed to serve the general welfare. His ideas have become the faith of the party.

Mackenzie King and his successor adopted the technique of gradualness and indirection. In the short run there has been inconsistency and opportunism. In the long run, however, large majorities and control of the national government since 1935 have made possible the implementation of a considerable segment of principles and policies.

Even though the federal system has imposed limits on national action, Liberal Governments have implemented through legislation their interpretation of the general welfare. They have developed such social services as unemployment insurance, family allowances, old age security, public health programs and much labor legislation. To promote the general welfare, Liberal Governments have provided a variety of aids for agriculture, manufacturing and others. While the party supports the private enterprise system, Liberal Governments have regulated and operated segments of the economy, particularly in transportation and communication, when they consider such action in the public interest.

The Liberal party has shifted from a policy of free trade to one of freer trade. Since Canada is very dependent on foreign trade, the party has worked for as free a trade situation as circumstances will allow.

Liberal Governments tried to avoid international commitments before World War II, but they now accept precise commitments under the United Nations Charter and the North Atlantic Treaty. Canada's closest relations are with Great Britain and the United States.

Liberal Governments can be criticized for a growing tendency to rush some measures through Parliament with little debate and for governing by orders-in-council.

502 pages. \$6.40. Mic 57-1066

FREEDOM OF SPEECH AND THE POWER OF COURTS AND CONGRESS TO PUNISH FOR CONTEMPT

(Publication No. 19,157)

Eleanor Tabor Linenthal, Ph.D. Cornell University, 1956

Freedom of expression is a fundamental principle of the democratic tradition in the United States, and the right to free speech, though subject to limitation, has long been regarded as a basic individual right. Co-existent with this tradition of free speech is that which holds, a) that courts may punish as contempts those acts which effect an interference with the fair and impartial administration of justice, and b) that legislatures, or their duly appointed committees, may exercise the power to punish for contempt in support of the legislative function.

The legislative power to punish for contempt is well established, but opponents of current practices of investigating committees contend a) that the First Amendment protects a "right of silence", a refusal to testify where

questions of thought and opinion are involved and b) that the terms and implications of the First Amendment limit the scope and procedure of committees of inquiry. When properly utilized, the investigating process contributes significantly to responsible government; the power to punish for contempt, however, is an integral part of that process. The demands of an efficient investigating process, therefore, run headlong into the competing demands of those who contend that compulsion to testify, concerning thought and opinion, violates the letter and spirit of the First Amendment to the Constitution.

The judicial power to punish for contempt, with respect to comment upon pending criminal proceedings, has been substantially confined since 1941. Federal courts may not punish out-of-court comment as a contempt; given a clear and present danger to the administration of justice, state courts may punish out-of-court comment as a contempt. Opponents of the summary contempt authority argue that any restriction upon out-of-court comment unduly burdens the right of free speech. Opponents of "Trial by News-paper," on the other hand, point out, and quite properly, that rights which co-exist in society are limited by the very fact of co-existence, and the right to a fair trial, therefore, should not be discriminated against because of the high value which is placed upon freedom of expression.

The contending claims of these two doctrines, that speech must be free and that courts and legislatures may punish for contempt in support of their functions, are patently in conflict at the present time. This study, therefore, has had, as its primary objective, a consideration of the impact of the power to punish for contempt upon freedom of expression. Attention has been directed to a) antecedents of the free speech-contempt controversy in English and American legal and constitutional history, b) the formal development of the contempt power in the United States, as exercised by courts and Congress, and c) the nature of the problems which currently exist as a result of the clash between the right to free speech and the legislative and judicial power to punish for contempt.

With respect to indiscriminate comment concerning pending criminal proceedings and the resultant "Trial by Newspaper", it is suggested that a) the rationale of the Supreme Court in Bridges v. California, Pennekamp v. Florida, and Craig v. Harney does not, and should not, extend to jury trials, b) the right to a fair trial is clearly jeopardized by certain kinds of comment relating to pending proceedings, c) restraints upon such comment do not constitute an unconstitutional burden upon free speech, and d) given certain procedural safeguards, the contempt power, without endangering the public interest in a public trial, could be utilized in support of the right to a fair trial.

With respect to the legislative power to punish for contempt, it is submitted that, a) poorly drafted enabling resolutions and inadequacies of committee procedure are mainly responsible for the free speech problems which have developed, b) investigations which have been primarily concerned with exposure have encouraged the growth of the doctrine of guilt by association, and thus, have effectively, if indirectly, interfered with the right of free assembly, and consequently, the right of free speech, c) that the role of the Congressional investigating committee is one of major importance, and that abuses of the investigating power may be remedied without any impairment of the desirable features of the inquiry process, and d) that

such remedies should be the product of Congressional action,—not the result of judicial efforts.

The tradition of free speech and the doctrine that courts and Congress may punish for contempt, in support of their function, are rooted in the past, but, as the present study clearly indicates, the contemporary conflict between them derives, in large measure, from changed patterns of legal, political, and constitutional thought with respect to a) the functions of government, b) the scope of individual liberties, and c) the nature of the judicial process.

333 pages. \$4.30. Mic 57-1067

TITOISM: CHANGES IN IDEOLOGY AND POLICY SINCE 1950 (PARTS I-III)

(Publication No. 20,136)

Charles Potter McVicker, Jr., Ph.D. Princeton University, 1956

This study deals with the development of Titoism as a separate political philosophy, as the most recent addition to the practice of Marxism-Leninism. The emphasis is upon the examination of the ideology and policy adopted by the Titoist decision-makers since 1950, the year in which they set out in earnest to broaden the theoretical and the practical foundations of their rule.

In this study, the development of Titoism is traced primarily through the major economic, agricultural, political-administrative, social, and legal reforms attempted since 1950; special attention is also given to the Titoist leaders' conception of the proper role of the state, of the Communist Party, and of the individual in the revolutionary-transitional type of society which they claim exists in Yugo-slavia.

The general conclusion is that Titoism as determined by its post-1950 ideology and policy represents a highly pragmatic form of government which is attempting to fuse democratic methods with socialist fundamentals. Although its spokesmen have yet to present a clear and concise theoretical explanation of their system in terms of the Marxist dialectic, they have implicitly explained it as a synthesis of Western liberal democratic and Marxist-Leninist practice. In attempting to realize this synthesis, the Titoists have found a new respect for the individual as the vital component of society -- a discovery which might readily be labeled as highly un-Marxian. Titoists now insist that socialism is meant to be the highest form of democracy and as such cannot hope to be achieved without democratic methods. Yet, their system as it exists in practice is one of minority rule, therefore they are forced to insist that democracy is but a political form not in itself a social force. Democracy as freedom for the individual is permitted to exist in Yugoslavia today only in those forms where it cannot challenge the total control of the Titoist regime. Real political freedom is conspicuous by its absence even though it furnishes the theoretical rationale for almost all fundamental Titoist law. Nevertheless, because the Yugoslav Marxists have, in theory at least, discovered the inseparable connection between socialism and democracy, and because they attempt to implement this discovery wherever it does not threaten their

own total control, Titoism has come to represent a halfway house to freedom, a middle stage between Stalinist tyranny and democratic socialism.

537 pages. \$6.85. Mic 57-1068

THE TRUMAN COMMITTEE: A STUDY IN CONGRESSIONAL-MILITARY RELATIONS

(Publication No. 20,149)

Donald H. Riddle, Ph.D. Princeton University, 1956

The Senate Special Committee to Investigate the National Defense Program, popularly known as the Truman Committee, was the most important single Congressional committee dealing with the mobilization program of World War II. From 1941 until 1948 the committee covered almost all phases of that program and exerted considerable influence on its course. In so doing the committee became an important part of the apparatus through which Congress discharged its responsibilities for civilian control of the military during the war.

The Truman Committee was not set up as a means of enabling Congress to control the military. Its major interest was in the domestic side of the war effort—the industrial mobilization. But the military's interest in that mobilization brought conflict with civilian agencies, and the role of the military in industrial mobilization was itself an important issue. Consequently the Truman Committee came into frequent contact with the military over a broad range of issues. Usually the committee supported the civilian agencies, and an important part of its efforts were directed towards maintaining the dominance of the civilian agencies over the military with respect to the mobilization effort.

This study places its emphasis on relations between the Truman Committee and the military. The committee's experience was broad enough, its contacts with the military were sufficiently extensive and direct, and its efforts at exerting civilian influence over the military were so important, that it provides an opportunity to draw some useful conclusions about the effectiveness and the limitations of the Congressional investigating committee in the control of military power.

From the important cases studied in detail, and from a summary of the committee's work, it is concluded that the Truman Committee made a number of important contributions to the war effort. Through its role as "trouble-shooter" it was able to assist on a number of vital issues throughout the war; it was responsible for huge savings in the costs of war goods; it served as a deterrent to fraud and corruption; it was an important source of information for the public and contributed to public confidence; and it was able to impose some restraint on the military.

The passing of time, the emergence of the United States as a leader of one half of a two-power world, and the Cold War have altered the traditional means of exercising civilian control of the military establishment. Particularly, there has been an increase in the importance of the President in that control, and a diminution of the role of Congress, especially in its exercise of the power of the purse. Thus the importance of Congressional scrutiny as a means

of influencing administrative policy within the military has been increased, and the special investigating committee is assuming a greater role.

Essentially, a Congressional committee is a device for influencing public opinion. While the military has secrecy as a means of protecting itself from public scrutiny, it cannot entirely insulate itself, even in wartime. The Truman Committee demonstrated that a responsible Congressional committee can exert an important and constructive influence on the military with respect to many activities in which civilians have a vital interest.

333 pages. \$4.30. Mic 57-1069

THE LABOR MANAGEMENT RELATIONS ACT AND THE PUERTO RICO LABOR RELATIONS ACT: A GENERAL COMPARISON

(Publication No. 19,881)

Sarah Esther Torres-Peralta, J.S.D. University of Illinois, 1956

The main subject of this work is a general analysis of the federal and Puerto Rican labor relations acts. Throughout the text special emphasis is placed on the discussion of the specific aspects of the field regulated in the two acts. This includes the controversies regarding representation of employees and the unfair labor practices enumerated in the acts.

Also, reference is made to certain provisions in each law, for which there is no equivalent in the other, but which are considered of paramount importance to the stability of the relations between labor and management. Among these are the so called "Secondary Boycott" provision of the Federal law and the procedure for enforcement of arbitration awards included in the local act.

Special attention is given in the last chapter of the thesis to a suggestion that the Puerto Rican Act be wholly revised without changing its prolabor philosophy. The need for a general revision of the local act emerges from the fact that ever since its approval in 1946 it has never been amended. The dynamism which characterizes the relations between labor and management requires that a legislative enactment regulating the field be kept up to date in accordance with the economic and social developments of the time. To this effect several essential amendments are suggested, including a revision of the procedure, expansion of regulation of unfair labor practices, specially the inclusion of a secondary boycott provision. It is considered by the author that the most important and most needed amendment of the local law is the concession to the Board of the extremely useful injunctive power so that illegal activities can be stop at its very inception.

An analysis of the problem dealing with the coverage of each enactment is included in the first part of the thesis. The jurisdictional issue is focused from the point of view of the new political status of the Commonwealth of Puerto Rico; the 1954 jurisdictional standards adopted by the National Labor Board; and the preemption doctrine. An attempt to delineate the limits within which each law applies is made in the first chapter, subject of course to the admission that this is one of the most difficult areas in the field.

After a thorough, although general analysis, on a comparative basis, of the two enactments, the writer reaches the conclusion that the coordinated application of the federal and local laws has helped a great deal to stabilize the relations between labor and management.

304 pages. \$3.90. Mic 57-1070

POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

THE DEVELOPMENT OF THE EXPANSIONIST CONCEPTS IN ITALY (1861 TO 1896)

(Publication No. 20,051)

Alphonso Anthony Castagno, Jr., Ph.D. Columbia University, 1956

Objectives and Method:

The treatise presents an analysis of the significant concepts of expansion in Italy during the period 1861 to 1896. It seeks to contribute to the understanding of the origin and development of these concepts and their acceptance or rejection by major segments of Italian society. As an ancillary objective, it examines the relationship between expansionist concepts and expansionist policies and the convergence of these concepts with interests and "expectations." In developing these inter-relationships an eclecticism of economic and "atavistic" theories of imperialism is used as the conceptual framework. "Concepts" are not treated exclusively in terms of content. Emphasis is also placed on the economic and politicosocial environment within which these concepts were fashioned.

Summary of Contents:

The nationalist and ideological setting is described along with a brief treatment of the concepts of Italian primacy. Social darwinism and the images of international politics as they impinged on the phenomenon of imperialism are also described. Particularly noted is the distinction between the human generosity of the Risorgimento and the ethnocentric imperialism of Turiello. The national sense of inferiority occasioned by the rebuffs at Tunisia and Egypt impelled a wider acceptance of the expansionist concepts. The influence of missionaries, explorers, mercantile and commercial interests and of population phenomena is analyzed. Of these influences those related to emigration and "overpopulation" emerge as the most persuasive on the Italian mentality. These factors are also examined in terms of the thinking and policies of Parliament which gave its central attention to expansionist concepts as expansionist policies were pursued in Northeast Africa. Among the political rulers Francesco Crispi emerges as the most prominent who rationalized imperialism before

Equally important during this period was the antiimperialistic tradition of the Risorgimento and the opposition to imperialism found among Socialists, Catholics, the literati, economic theorists and sociologists. The impoverished economic conditions of the nation accounted for the widespread opposition of the bourgeoisie and the proletariat to Italian colonial policy. These elements, combined with the lack of economic propulsives such as excess capital and surplus production, militated against the fruition of the imperialist movement during this period of Italian history.

Conclusions:

Italian sensitivity to European attitudes, issues of national prestige, and the need to integrate a centrifugal society impelled nationalists to expound and pursue imperialism. Of the economic motives, commercial expansion and outlets for the "surplus" population were the most persuasive on the nation. The expansion of Italy in Northeast Africa, however, did not mean a national acceptance of the expansionist concepts. Italy was torn between the principles which gave birth to the nation and the new condepts of alien domination and conquest. The consequent synthesis was a colonial policy marked by secrecy, deception, vacillation, confusion and by a dubious conviction in its ideological foundation and its moral correctness. Nonetheless, imperialist literature and propaganda exerted a pervasive influence on Italian thought which may be accurately traced through the Fascist Age. The fusion of the demand to raise Italian prestige and honor--severely damaged by Adowa--and the insistent quest for a demographic outlet, occasioned by the proletarian character of the nation, gave rise to the concept of the struggle between the "Have" (Bourgeois) and the "Have Not" (Proletarian) powers. 301 pages. \$3.90. Mic 57-1071

CONSOLIDATION OF INDIA SINCE INDEPENDENCE:
A COMPARISON AND ANALYSIS OF FOUR INDIAN
TERRITORIAL PROBLEMS—THE PORTUGUESE
POSSESSIONS, THE FRENCH POSSESSIONS,
HYDERABAD AND KASHMIR

(Publication No. 18,230)

Harry J. Friedman, Ph.D. University of Pittsburgh, 1956

There are three major purposes in drawing together into one study an analysis of India's conflicts with other governments over the territorial issues of the Portuguese possessions, the French possessions, Hyderabad, and Kashmir. One purpose is to emphasize the fact that there are deep underlying causes in all four conflicts that cannot be seen by examining each dispute in separate isolation. Another purpose is to compare the problems to each other, in order to examine the similarities and differences among them. The final purpose is to relate the significance of the disputes to India's growing importance in the world and to her influence in the areas of new nationalism.

The controversies over the Portuguese and French possessions have striking similarities. Both disputes involve attempts by India to integrate small coastal territories, held by the European countries, into the Indian Union. In both cases, mass resistance to the authority of the European governments has played an important part. In both disputes, India has resisted the temptation to effect integration through the use of armed force.

A basic difference between the two problems, however,

is the fact that France agreed to negotiate with India and Portugal has refused. The French possessions were merged with the Indian Union in 1955. Portugal continues to insist that India has no right to challenge a 400-year-old legal claim to the Portuguese possessions.

The disputes over Hyderabad and Kashmir also have notable similarities. Both controversies involve princely states which attempted to remain independent of the Indian Union, after the British withdrew from the subcontinent in 1947. Both states have had internal conflicts between Muslims and Hindus. In both disputes, India was forced to use armies.

Again, a basic difference is apparent, however. The conflict with Hyderabad was settled in 1948, when Indian troops established quick control over the state. The conflict over Kashmir, however, is between India and Pakistan, with no settlement in sight to this day.

Four conclusions were drawn from the study of the disputes. One is that political forces, not legal rights, have been the chief determinants of India's stand in each case. The political forces of nationalism and domestic pressure groups have influenced the Indian government to push its claims to each territory vigorously.

Two, the effects of the disputes have been world-wide in scope, rather than being confined to the Indian subcontinent only. The United Nations has been forced to play a role in each controversy and the "cold war" disputants have been forced to take public stands on the issues.

Three, the moral teachings of Gandhism, with their emphasis on nonviolence, have played a role, but a minor one, in establishing India's positions in the controversies. India's present leaders were influenced by Gandhi, but their actions are based primarily on political necessity.

Finally, it was concluded that Indian successes in the disputes will encourage expansion of India's role in world politics. Success in the two remaining controversies would encourage the country to attempt to speak in the name of all Asian governments in international relations.

182 pages. \$2.40. Mic 57-1072

LEGAL EFFECT OF WORLD WAR II ON TREATIES OF THE UNITED STATES

(Publication No. 20,059)

Stuart Hall McIntyre, Ph.D. Columbia University, 1956

This study consists of an empirical examination of the legal effect of war upon those treaties to which the United States and one or more enemy states were parties at the outbreak of World War II.

After an historical survey of the position of the United States on the question of the effect of war on treaties, in which it is shown that the United States has progressively minimized the effect of war on most types of treaties, the specific treaties which were in force with Germany, Japan, Italy, Hungary, Rumania, and Bulgaria at the outbreak of World War II are individually considered to determine what effect World War II had upon them. The treaties are arranged according to their subject matter within the broad categories of political, economic, and humanitarian. Every development bearing upon the legal status of each of these treaties is carefully considered.

This exposition and analysis of developments affecting the specific treaties comprises the bulk of the study. There follows a discussion of peace treaty provisions dealing with the prewar agreements.

In the conclusions it is observed that the United States did not regard any prewar treaty as definitely terminated by World War II. Most treaties were probably suspended between opposing belligerents, although some, including even a few bilateral treaties, continued at least in part in

force for all the contracting parties.

In determining the status of a particular treaty during the war, the United States regarded the intention of the parties at the time they contracted as decisive if that intention could be clearly ascertained. When the intention of the parties as to the effect of a future war between them was not clear, as was usually the case, the United States looked to other elements for guidance in reaching a decision as to the disposition of the treaty. The nature and purposes of the treaty were examined by the decision makers to determine whether private rights were involved, whether the treaty was multilateral or bilateral, and what the relationships and activities required by the treaty

were. These elements were then considered to determine the compatibility or incompatibility of the treaty provisions in question with national policy during the war. If they were compatible, they were applied; if not, the provisions were not applied.

The United States appeared to regard suspended parts of multilateral treaties as reviving automatically with the cessation of hostilities. Provisions regarding revival of multilateral conventions were generally omitted from the peace treaties. When they were included they were of declaratory significance only. Although some bilateral treaties appear to have revived automatically with the end of hostilities, each of the peace treaties included provision for the revival or continuance in force of prewar bilateral treaties.

The practice of the United States reflected on the whole continuing adherence to the principle of minimization of the effect of war on treaties, with a view to respecting the intention of the contracting parties, protecting private rights and rights of states which were not enemy belligerents, and maintaining the integrity of the international legal order.

585 pages. \$7.45. Mic 57-1073

PSYCHOLOGY

PSYCHOLOGY, GENERAL

CERTAIN PSYCHOLOGICAL FACTORS ASSOCIATED WITH ACCULTURATION: A STUDY OF THE RELATIONSHIP BETWEEN SURVIVALIST, ASSIMILATIONIST, AND INDIFFERENT ATTITUDES AMONG MEMBERS OF AN ETHNIC MINORITY, AND CERTAIN PSYCHOLOGICAL FACTORS

(Publication No. 19,984)

Bernard Brachya Cohen, Ph.D. New York University, 1956

The purpose of the study was to determine whether survivalist, assimilationist, and indifferent attitudes among Jewish male college undergraduates were related to the following psychological factors: hostility, dependence, and anti-democratic attitudes.

In the acculturation process, a member of an ethnic minority can either strive to maintain the survival of his minority culture, assimilate with the majority culture, or remain relatively indifferent to these two alternatives. Both survivalist and assimilationist ideologies can be considered as a form of ethnocentrism. Certain psychological factors have been found to operate in the ethnocentric personality: unconscious hostility toward parents that is displaced onto others, dependence, and authoritarian or anti-democratic attitudes.

It was therefore hypothesized that when survivalist and assimilationist individuals are compared with those who are indifferent, they would show: more covert hostility toward parent figures; a greater preponderance of covert hostility over overt hostility toward parent figures; more

dependence upon parent figures; and stronger anti-democratic attitudes.

The subjects in the study, twenty survivalists, twenty assimilationists, and twenty indifferent Jewish male college undergraduates were chosen by the unanimous decision of three judges on the basis of their replies to the Group Attitude Questionnaire. The questionnaire elicited acculturation attitudes toward the Jewish group by evoking reactions to a number of hypothetical acculturation situations involving area of residence, Jewish education and organizations, Jewish name and identity.

Selected cards of the TAT were administered and rated by the judges for hostility toward and dependence upon parent figures. A scale eliciting conscious attitudes of hostility toward parents, the Parent Attitude Scale, was administered and rated by the judges. The Fascism Scale was used to determine degree of anti-democratic attitudes. Subjects were also asked to rate the group attitude of their parents as they perceived them. The conclusions of the study were as follows:

Patterns of hostility toward father figures had differentiated the Survivalist and Indifferent groups. As a group, the Survivalists showed significantly greater unconscious hostility toward father figures than did the members of the Indifferent group.

Anti-democratic attitudes had differentiated two of the experimental groups from the third. The Survivalists and Assimilationists both showed significantly greater anti-democratic attitudes than did the Indifferent group.

The hypotheses in regard to dependence were not confirmed. The Indifferent group expressed greater dependence upon mother figures than did the Survivalist group, and the Survivalist group expressed greater dependence

upon father figures than did the Assimilationist group. These findings were qualified by the absence of measures of conscious and unconscious dependence.

Identity or discrepancy of subject group attitude with parent group attitude did not reveal a significant relationship to consciousness of hostility or to dependence,

161 pages. \$2.15. Mic 57-1074

LIKES AND DISLIKES OF COLLEGE STUDENTS IN RELATION TO ADJUSTMENT AND ACHIEVEMENT

(Publication No. 18,926)

Louis B. Gaffney, Ph.D. University of Minnesota, 1956

A number of investigations have shown that a person's interests, attitudes, likes, or dislikes are related to personality variables. Review of previous research raised this hypothesis: College students who are emotionally disturbed differ from randomly selected students in the total number of likes, indifferents, and dislikes (LID) they record on college type items. To test this hypothesis a questionnaire of 440 items was prepared which attempted to incorporate a wide span of items that college students meet, deal with, or discuss. Many items were submitted by students, while others were incorporated verbatim as they were used in previous research.

The questionnaire was mailed to 300 students chosen randomly, and to 134 students who were judged by experienced counselors to be emotionally disturbed. A total of 92.4% of the students contacted responded to the questionnaire. Because sexes were compared separately, there were four main groups for comparison, random male, experimental (disturbed) male, random female, and experimental female. These groups were compared in a 2-way analysis of variance on 3 subject-variables of age, ACE, and HPR, and 27 LID variables from the questionnaire. In addition correlation relationships were computed between subject-variables and the questionnaire-variables of 400 verbal LID items.

Analysis of the three subject-variables revealed that there were no significant between-groups differences (differences between random and experimental groups) and no between-sexes differences.

The 27 questionnaire variables comprised 9 categories of like, indifferent, and dislike. These included a list of 22 pastimes used by Berdie, 20 food aversions used by Wallen, 68 items on people, 12 numbers, 20 abstract designs, 20 nonsense syllables, and 3 different combinations of total scores. The first total was of the 400 verbal items, the second added 20 abstract designs to this, the third added the syllables.

Analysis of the 27 questionnaire variables revealed that there were significant between-groups differences on totals and some subgroups of items for likes and indifferents. Contrary to expectation, dislikes failed to differentiate the groups. Sex differences proved to be much greater than differences between groups, and were significant on most of the LID variables. No significant correlations were obtained between the subject-variables of age, ACE, and HPR, and the 400 verbal item totals. Although group averages were significantly different for the random

and experimental groups, the overlap of scores was so great that individual prediction was all but impossible.

The most unexpected result of the research was that contrary to most previous findings, the disturbed college students recorded more likes than the randomly chosen students. This was true not only of the totals of the heterogeneous items, but also of the subgroups of homogeneous items. Since the disturbed students recorded more likes for totals and specific types of items, it seemed that the discrepancy between this research and former studies was due more to the college group sampled than to the type of item. There is also a possibility that the result was influenced by an elaborate personnel and counseling program. It may be common persuasion of counselors, and almost a stereotype, that well adjusted students have a broader range of interests and likes. Many of the students in the experimental sample had received counseling. This persuasion could have been communicated in direct or subtle ways through the counseling program until the intelligent disturbed student "overcompensated" by record-303 pages. \$3.90. Mic 57-1075 ing more likes.

SELECTED FACTORS OF GROUP INTERACTION AND THEIR RELATION WITH LEADERSHIP PERFORMANCE

(Publication No. 19,450)

Frank W. Lanning, Ed.D. North Texas State College, 1956

Statement of Problem

The problem of this study is to find in the "light" of a "field" concept of leadership, what the relation is of three factors of group interaction to the level of performance of leadership roles. The three factors of group interaction to be studied in relation to the level of performance of leadership roles are socioempathy, sociometric status, and self-group identity. Each factor gives a measure of some degree of the quality of interaction of the individual to the group and the group to the individual. Therefore, a high level of performance of leadership roles should be related with a high measure of the three factors, indicating a high or better adjusted quality of group interaction.

Sources of Data

The following sources of data were used:

- 1. The primary source of data consisted of the experiences gathered from four "year-around" camping groups, two groups of eight boys and two groups of ten boys.
- 2. Sociometric tests were given at the beginning of the study.
- 3. Ratings by the two counselors of each group on a five-point scale.
- 4. Ratings of individual leadership performance on a five-point scale by the group.
- 5. Self-ratings of individual leadership performance on a five-point scale by the group.
- 6. Ratings of individual leadership performance on a five-point scale by the investigator.

Chapter Content

In Chapter I the purpose of the study, statement of the problem, and the hypotheses are stated first. This is followed by a discussion of sources and treatment of data, the limitations of the study, definition of terms, and a review of research.

Chapter II discusses the methods used in rating level of leadership performance and the method and results of checking the reliability of the instrument used. The latter part of the chapter discusses the trend of an individual being rated high in one leadership situation to be rated high in other leadership situations.

Chapter III shows that the factors of age, length of time in camp, and intelligence quotients have little relationship with the level of leadership performance.

Chapter IV discusses the factors of socioempathy, sociometric status, and self-group identity from the standpoint of their individual contribution. In the last part of the chapter the intercorrelations of the factors are established and discussed.

In Chapter V the significantly superior efficiency of the subjects of the fourth quartile over the subjects of the first quartile is shown and explained.

Finally, in Chapter VI, the summary is made and the conclusions are drawn from an analysis of the data.

Findings

Some of the findings were as follows:

1. The intercorrelations (rho) between the factor of socioempathy, both own and others' estimation of rank, and the level of leadership performance were found to be positive and moderately high.

2. In the socioempathic factor of the efficiency of being able to estimate own acceptance or ranking in leadership performance, the subjects of the fourth quartile showed a significant difference over the subjects of the first quartile.

3. With the factor of self-group identity, the subjects of the fourth quartile showed a distinct advantage over the subjects of the first quartile in the closeness of their self-evaluation with mean rating that the group gave them.

4. The subjects of the fourth quartile of level of leadership performance were generally accepted better, as measured by the sociometric tests, than were those subjects in the lower or first quartile.

Conclusions

1. That there exists a positive relationship between the level of performance of leadership roles and the factors of socioempathy, sociometric status, and self-group identity.

2. That the subjects of the upper or fourth quartile show a significantly greater ability to perceive own and others' rank, are more often chosen on both play and work criteria of sociometric tests, and more often rate themselves as the group rates them.

3. The fact that leadership seems dependent upon the interrelationships of personality and behavioral variables (as shown by the relation of the three variables in this study), rather than upon individual traits, suggests that leadership training is most effective when children experience the skills and values in a variety of real situations.

4. The data of this study tend to support an interactional theory of leadership. 125 pages. \$2.00. Mic 57-1076

DIFFERENCES IN THE EARLY CHILDHOOD MEMORIES OF AUTHORITARIAN AND NONAUTHORITARIAN PERSONALITIES

(Publication No. 19,996)

Daniel I. Malamud, Ph.D. New York University, 1956

The purpose of this study was to investigate differences in the early childhood memories (the very earliest memory, the first one of mother, and the first one of father) of authoritarian and nonauthoritarian personalities.

The F scale (an instrument for measuring authoritarian trends) and a Childhood Memory Questionnaire were filled out by 1977 female student nurses, serving as subjects. Subjects whose F scale scores fell in the lower and upper quartiles of the total group constituted a pool from which were selected 200 low scorers (nonauthoritarians) and 200 high scorers (authoritarians) matched pair by pair with respect to religion, education, and age. One set of 100 equated pairs (100 Lows, 100 Highs), the Initial set, was established for the purpose of comparing their childhood memories and discovering those memory-characteristics in which they differed significantly. The remaining set of 100 matched pairs (100 Lows, 100 Highs), the Validating set, was established for testing the reliability of those differences which emerged from the initial comparison.

A method of categorical analysis similar to that used in the Thematic Apperception Test was devised for coding and "scoring" each memory. Before analyzing the memories, the investigator predicted what findings could be anticipated for each category, based on a careful review of earlier findings on the authoritarian personality. Each memory was scored without foreknowledge as to whether it belonged to the High or Low groups.

Mean scores on each category were obtained for Low and High groups in both sets; the most consistently discriminating categories were submitted to a refined qualitative inspection in order to discover previously unobserved or unanticipated trends. The categories differentiating Lows and Highs most reliably were interpreted with reference to the childhoods, the current personality trends, and the probable nursing roles of the two groups. The interpretive highlights may be summarized as follows:

- 1. According to the Low's memories, their earliest years were marked by warm, intimate, playful relations with their parents and by a wide range of learning experiences. In contrast, the Highs report a childhood in which affectional deprivation, physical punishment, affliction, and furtively expressed resentments were pronounced. Lows tended to experience their childhood anxieties consciously, often in the form of concern for others, while Highs tended to act out their anxieties in the form of misbehavior and accidents.
- 2. The Lows perceive their environment in terms of warmth and affectional closeness, express strong needs for autonomy and independence, and reveal a greater contact with their inner life and a greater freedom in expressing it. In contrast, the Highs perceive their environment as cold, distant, and low in affectional reward. They respond to the perceived coldness of their environment with resentment and with intense fear which blocks direct expression of this resentment. Their orientation to the environment is a passive-dependent

1904

1935

1956

M.Ed.

Ph.D.

one. They attempt to cope with their fears and sense of weakness by aligning themselves with authority.

3. It would seem from the foregoing that Lows would be more likely than Highs to be drawn to nursing as a means of achieving affectional closeness, as an outlet for their concern for others' welfare, and as an opportunity to satisfy their needs for learning and autonomy. In contrast to Lows, Highs are less likely to be aware of their own feelings and those of the patient, to express their irritations in open give-and-take, and to be aware of the patient as an emotionally disturbed person.

The results, on the whole, give strong support to the hypothesis that reliable differences, consistent with earlier findings on the authoritarian personality, exist between the early childhood memories of authoritarian and nonauthoritarian personalities. Early memories do appear to reflect an individual's present style of life and his way of looking at himself and at the world.

138 pages. \$2.00. Mic 57-1077

AN EVALUATION OF SOME OUTCOMES OF GENERAL AND EDUCATIONAL PSYCHOLOGY COURSES FOR EDUCATION STUDENTS

(Publication No. 19,949)

Blanche Warren McCluer, Ph.D. The Pennsylvania State University, 1956

The purpose of the study was to evaluate education students' exposure to their required psychology courses. The study consisted of two parts: (1) an evaluation of the outcomes of the introductory course, and (2) an evaluation of the outcomes of the educational course. Both parts of the investigation were made in three areas -- achievement, elimination of misconceptions, and personality adjustment.

The investigation was conducted at State Teachers College, Indiana, Pennsylvania. Two hundred ten students in general psychology, and 162 in educational psychology assigned to three instructors in each course, were subjects for whom completed data were available.

A battery of three tests was administered twice. The battery consisted of (1) an instructor-constructed achievement test of 171 items for general psychology, and one of 193 items for educational psychology; (2) an instructor-constructed misconceptions test of 75 items (positive and negative statements of common erroneous beliefs regarding behavior); and (3) the Mental Health Analysis. The misconceptions and personality tests were common to both groups. Each test was given during the first week of the semester as a pretest and the last week of the semester as a post-test. Only those students who completed all six tests in the battery were regarded as final participants in the study.

Means, standard deviations, reliabilities of differences between means, and product-moment correlations were calculated to answer relevant questions.

Reliable and sizeable changes resulted in each of the three areas studied, the most sizeable being in achievement.

Reliable differences in amounts of change between the classes of different instructors occurred in all three areas

in the introductory psychology courses; and in achievement, in the educational psychology course.

It was not consistently found that students who gained most and least in one area also showed similar degrees of gain in other areas. The correlation between achievement gains and mental health gains was the highest relationship in both the introductory and educational courses (.542 and .384 respectively).

There was very little relationship between standings in the three areas at the end of the courses, with the exception of final scores in achievement and misconceptions in the introductory course (.461).

All-college averages and freshman reading test scores of students benefiting most and least in each of the areas varied widely. There were no significant relationships between any of the gains obtained and either of these variables except achievement gains in educational psychology and all-college average.

VITA

Born:

| Education: | | |
|---|------|------|
| High School, Marshall, Indiana (Completed) | | 1922 |
| Indiana State Teachers College, Terre Haute, Indiana | B.S. | 1928 |
| The Pennsylvania State College, | | |

State College, Pennsylvania

The Pennsylvania State University,

University Park, Pennsylvania

Professional Experience:

Woodstock, Kentucky

| Senior High School, Clinton, Indiana | 1924-1929 |
|---|----------------------|
| Indiana State Teachers College, Terre Haute, Indiana | 1929 S.S. |
| Windham High School, Willimantic, Connecticut Connecticut Agri- cultural College, Storrs, Connecticut | 1929-1931 |
| State College High School, State College, Pennsylvania | 1934-1935 |
| The Pennsylvania State College, State College, Pennsylvania | 1946-1949 |
| State Teachers College, Indiana, Pennsylvania 174 pages. \$2.30. | 1951- Mic 57-1078 |

STABILITY OF INTEREST OF COLLEGE STUDENTS

(Publication No. 19,451)

William D. Pollan, Ed.D. North Texas State College, 1956

The problem of this study was to determine the relationship of age, sex, or both upon stability of interest of

students in the School of Education of North Texas State College, Denton, Texas. The study was divided into four stages. These four stages involved four questions to be answered.

1. Do the differences between the amount that boys' interests shift and the amount that girls' interests shift,

vary from one age level to another?

Using the 2×2 factorial analysis of variance it was shown that the difference between boys' and girls' mean changes did not differ significantly from one age level to the other.

2. For the two age groups combined, are girls' interests more or less stable than boys' interests?

Since there was no interaction, the age levels were combined, and the 2 x 2 factorial analysis of variance was used to test the effect of sex. The test revealed a significant change at the .05 level in the amount that boys' scores shifted and the amount girls' scores shifted over the two-year period on the Computational, Scientific and Persuasive Scale. In the case of the other seven scales the difference in the amount that boys' scores shifted and the amount that girls' scores shifted over the two-year period was insignificant.

3. For the sexes combined, are the shifts greater at some age levels than at others?

The sex groups were combined and tested for significant difference between mean changes for the two age levels since there was no interaction. The 2 x 2 factorial analysis of variance yielded insignificant values of F; that is, age was not a factor in determining the amount of shift in scores over the two-year period.

In testing the effect of age upon mean change within the sex group, an additional age group was added to each sex group. This provided three groups for each sex with the males ranging from twenty through twenty-two and the females from nineteen to twenty-one, inclusive. Simple analysis of variance was used to test for significant difference of mean change from age group to age group in each of the sex groups. There was no significant difference of mean change from age level to age level for the male subjects.

There was a difference of mean change at the .05 level of significance among the age groups for the female subjects on the Scientific Scale. There was no significant difference of mean change from age level to age level for the female subjects on the other nine scales.

4. Is there a significant change of interest for either the males or females over the two-year period?

The t test was used to check the combined age groups of each sex group for significant difference of mean change over the two-year period. The t test of the data for the male subjects yielded a significant value of t for the Outdoor, Scientific, Literary, Musical and Social Service Scale. The t test of the data for the female subjects disclosed a significant difference at the .05 level for each of the nine scales. The t test was used to check the data of each age group of female subjects on the Scientific Scale. Instability was not demonstrated for the nineteen year age group. Instability at the .01 level of significance was demonstrated for both the twenty and twenty-one year age groups.

87 pages. \$2.00. Mic 57-1079

PSYCHOLOGY, CLINICAL

A COMPARATIVE STUDY OF THREE THERAPY TECHNIQUES USED TO EFFECT BEHAVIORAL AND SOCIAL STATUS CHANGES IN A GROUP OF INSTITUTIONALIZED DELINQUENT NEGRO BOYS

(Publication No. 17,637)

Paula McKinney Brown, Ph.D. New York University, 1956

The problem:

The purpose of this investigation is to compare three therapy techniques: (1) immediate group therapy, (2) delayed group therapy, and (3) attention, as applied to institutionalized children; to evaluate them in terms of objectively rated aspects of behavior and social status; to test the hypothesis that, as a result of group therapy, changes will be effected in the behavior and social status of the participants, and that immediate therapy will be more effective and its effects more lasting than would be the case if therapy were introduced at a later period.

Design of the study:

Sixty institutionalized delinquent boys were divided in groups of twenty. Groups A, B, and C. The design required three testing periods: Test I took place at the outset of the investigation, Test II six weeks later and Test III six weeks after Test II. The period from Test I to Test II is referred to as Stage I, the period from Test II to Test III as Stage II.

During Stage I, Group A was given no group therapy and no attention; during Stage II this group was given group therapy. Group B was given group therapy during Stage I, and was given no therapy or attention during Stage II. Group C was given library attention during Stage I, and no attention or therapy during Stage II.

Tests I, II and III consisted of the Haggerty-Olson-Wickman Behavior Rating Schedules, which were filled out by the house parents, and sociometric data on group status drawn from stated affinities and dislikes of individuals comprising the groups in this investigation.

The Behavior Rating Schedules yield raw scores and the sociometric data are also in numerical raw score form. These numerical scores were evaluated by means of the "t" test for the difference between two matched groups.

Conclusions

- 1. Group therapy appears to be more than attention. It appears to be a re-educational process which continues even after the removal of the therapeutic contact.
- 2. Group therapy appears to be more effective if applied immediately upon incarceration rather than at some later time.
- 3. Attention in the form of library work appears to be effective while the attention is applied. Withdrawal of the attention apparently leads to a reversal of the effect of attention.
- 4. Sociometric status changes appear to be effected when the group is under formal group therapy; these changes, however, are not maintained.

Implications

The results of the study indicate that, not only group

therapy, but mere attention produces changes in the behavior of children; therefore the implication is drawn that a vast majority of our children may fail to receive even this nominal amount of needed interest.

The results indicate that interview group therapy, used in conjunction with juvenile courts, may be a positive means of circumventing greater social maladjustment of the delinquent.

The growth potential of the individuals in Group B was maintained, implying, therefore, that greater provision of therapy facilities in schools and other community agencies would be effective in the treatment of delinquents. It is also implicit that adequate attention with young children evidencing signs of behavior disorder, may prove to be one of the most effective agents in the prevention of future delinquency.

189 pages. \$2.50. Mic 57-1080

SELF ACCEPTANCE AND MARITAL HAPPINESS

(Publication No. 20,054)

Daniel Eastman, Ph.D. Columbia University, 1956

Previous researches on the psychological correlates of marital happiness have relied on electic personality measures of limited theoretical and clinical significance. In this study self acceptance was chosen as a personality measure, because it is a unitary factor based on a developed theory of personality, with explicit clinical implications.

Method

Self acceptance was measured by Bill's discrepancy method; a factor called acceptance of others by a modification of the same method; and a factor called psychological status as the difference between self acceptance and acceptance of others.

The possibility of differential acceptance of men and women implicit in acceptance of others was investigated, by asking the subjects to rate the two sexes separately.

The personality factors were then correlated with marital happiness, measured by Wallace's method, for a sample of fifty couples married more than two years, and a sample of fourteen couples married less than two years.

Results

Preliminary research showed a correlation between self acceptance and acceptance of others averaging .34 for three samples; showed no significant mean difference between sex groups on any of the personality factors; and showed both sex groups to have an equal tendency to rate women less acceptable than men, in terms of the subjects' own ideals.

For the fifty couples married more than two years, marital happiness showed a significant correlation with both the subjects' and their mates' self acceptance. The summed self acceptance of both partners correlated .44 with the wives' happiness, and .53 with the husband's happiness. The unitary factor of self acceptance when summed for both partners had practically as high a correlation as

any other factor or combination of factors previously investigated.

Differences in marital behavior of the two sexes were indicated by: a higher correlation of the wives' self acceptance with their husbands' happiness, the correlation remaining uniquely significant even when the wives' own happiness was held constant by partial correlation; and by the fact that acceptance of others in the wives alone correlated significantly with both their own and their husbands' happiness, whereas psychological status in the husbands alone correlated significantly both with their own and their wives' happiness.

The tendency of both sexes to rate women less acceptable than men showed no significant correlation with marital happiness in either sex.

The sample of fourteen couples married less than two years showed a significant correlation between the husbands' happiness and their wives' self acceptance, and, contrary to the older marriages, a significant correlation between the husbands' happiness and their wives' psychological status.

Conclusions

Self acceptance, acceptance of others, and psychological status are all factors in marital happiness; self acceptance in both sexes, acceptance of others probably only in wives, and psychological status probably only in husbands, in established marriages.

The relation of self acceptance, acceptance of others, and psychological status to marital happiness is affected in a definable way by average differences in the character structure and motivation of the two sexes.

99 pages. \$2.00. Mic 57-1081

THE EFFECT OF REPEATED PRAISE OR BLAME ON THE WORK ACHIEVEMENT OF BLIND CHILDREN

(Publication No. 20,056)

Howard Robert Kent, Ph.D. Columbia University, 1956

The development of two major educational philosophies in relation to blind children has stimulated much discussion concerning the relative merits of each. Although the common goal of preparing the child to take his place as a capable and productive adult in the sighted world is espoused by the adherents of both systems, the conditions under which educational efforts are made vary markedly.

The present study represents an effort to shed some light on two major questions of some relevance to the larger issue involved; specifically, (a) are the motivational needs of blind children similar to those of sighted children?, (b) are the motivational needs of blind residential school children similar to those of blind public school children?

The experiment was patterned after an earlier study by Thompson and Hunnicutt¹, in which it was found that extraverted sighted children were more effectively motivated by being blamed for their efforts, while introverted children responded more effectively to praise. Either incentive was found to be more effective than a no-incentive situation.

These findings were restated as hypotheses related to blind children in the present study, in order that comparisons between blind and sighted children might be made. Null hypotheses concerning differences between residential school and public school blind children were also investigated.

The first group of subjects consisted of 60 residential school blind children, the second of 43 public school blind children, and the third of 60 public school sighted children. A Control group of 30 residential school blind was used to test the incentive versus no-incentive hypothesis.

The Introversion-Extraversion Scale of Aspects of Personality, by Pintner and others, was administered, and all experimental subjects were classified as introverted or extraverted. Two weeks later, an adapted version of the Woodworth-Wells Number Cancellation Test was given for six trials on alternate forms. Half of the extraverts were praised for their efforts, half were blamed. The introverts were similarly treated. The difference in scores between the first and the sixth trials was considered representative of response to the praise-blame variable.

The results indicated that either incentive was more effective than none in the case of residential school blind children but not in the case of the public school blind. The results did not support earlier findings of the superior value of blame with extraverted children, in respect to either blind or sighted groups. Regardless of personality type or visual status praise was found to be the more effective motivating influence. The degree of achievement, in response to either motivational variable, proved to be not different between the sighted and the residential school blind groups. Both of these groups, however, significantly exceeded the public school blind.

The major conclusions drawn were that blind children could not be considered a homogeneous group with respect to the motivational responses investigated, and that similarity to sighted children, in this respect, was dependent upon the environmental circumstances of the blind groups involved.

These conclusions were discussed on two grounds. First, the extent to which educational experiences of the two blind groups resembled those of the sighted, and the degree to which the experimental situation held the same meanings and values was considered. The extent to which the dissimilar environments of the two blind groups promoted confidence in the ability to achieve, and consequent responsiveness to achievement demands, was also discussed.

Implications of the study were discussed in terms of the blind child's needs for satisfying group experiences, with both the blind and the sighted, in order that the ability and the desire to achieve, and to respond to a challenging situation, might be developed.

71 pages. \$2.00. Mic 57-1082

1. G. G. Thompson & C. W. Hunnicutt. The effect of repeated praise or blame on the work achievement of "introverts" and "extraverts." J. Educ. Psychol., 1944, 35, 257-266.

A STUDY OF THE EFFECTS OF GROUP DISCUSSION ON THE ATTITUDES OF MOTHERS TOWARD THEIR CEREBRAL PALSIED CHILDREN: AN INVESTIGATION OF THE ATTITUDES OF MOTHERS OF CEREBRAL PALSIED CHILDREN AND THE EFFECTS OF GROUP DISCUSSION ON THESE ATTITUDES

(Publication No 17,657)

Benedict Taxier Lassar, Ph.D. New York University, 1956

Chairman: Professor Brian E. Tomlinson

Purpose

PSYCHOLOGY

The purpose of this investigation was to discover whether a series of group discussions on child-rearing and related mental hygiene problems is effective in changing the attitudes of mothers toward their cerebral palsied children.

Hypothesis

The basic hypothesis was that a group of mothers of cerebral palsied children provided with a series of group discussions would manifest greater attitudinal changes in a positive direction than a control group for whom no group discussions were provided.

Population

The subjects of this investigation were 19 New York City mothers of preschool children who acquired cerebral palsy before, at, or shortly after birth, and who live at home with both parents.

Method

Four groups were formed, three experimental groups (two with five mothers each, one with four) and one control group of five mothers. Tests of significance indicated with .95 confidence the equivalence of experimental and control groups with respect to mean age, education, income, socioeconomic status, number of children.

In the pre-experimental period all 19 mothers were given a controlled interview, and Indirect Questionnaire, prepared by the researcher, a partial TAT containing five cards of the Bachrach Revision.

The experimental period consisted of 15 weekly group discussions each lasting approximately one and one-half hours. The method was eclectic with emphasis on the client-centered approach.

Following this period both experimental and control groups were re-examined with the Indirect Questionnaire and the TAT. The experimental groups were also given a final questionnaire.

Various non-parametric tests of significance were then applied to compare the initial and final test scores. Qualitative analyses of all the data were also made.

Findings

- 1. In the pre-experimental period, qualitative analyses of the initial interviews and tests indicated that 13 of the 14 experimental subjects and 3 of the 5 controls were overprotective, domineering or rejecting toward their handicapped children.
- 2. In the post-experimental period the findings for the experimental group in the Indirect Questionnaire were:

 Dominance excepted, statistically significant improvement

occurred in the attitudes measured - overprotection (.01 level), rejection (.05 level), discipline (.05 level). Knowledge of child development and guilt also improved significantly at level .05.

For the <u>control</u> group there was no statistically significant improvement in any of the above.

3. The findings in the TAT, scored by the Fine technique, were: For the experimental group there was a statistically significant improvement in the affective categories (.05 level), outcomes of the stories (.02 level), recognition of disability (.03 level). No statistically significant improvement was found for the control group.

4. A qualitative analysis of the tape-recordings revealed a tendency for the mothers in the latter two-thirds of the group discussions to increase the number of positive statements and to decrease the number of negative statements concerning their cerebral palsied children as compared with the first-third.

5. Further analyses of the group discussions revealed that eleven of the fourteen experimental subjects moved in a positive direction in the attitudes measured.

6. The final questionnaire revealed the mothers eager to continue the meetings. They obtained some relief, lost some feelings of uniqueness, acquired information about cerebral palsy and the handling of children so afflicted.

Conclusions

The following findings support the basic hypothesis:

1. The attitudes of the groups that participated in the discussions moved significantly in a positive direction whereas the control group's attitudes tended to remain approximately the same.

2. Group discussions in a permissive atmosphere are effective a) in reducing unfavorable attitudes and feelings of uniqueness, b) as a learning process. Mothers appear to be more willing to accept suggestions and criticisms from others who have had similar experiences.

358 pages. \$4.60. Mic 57-1083

CONCEPTUAL BEHAVIOR IN SCHIZOPHRENICS AND BRAIN-DAMAGED PATIENTS: AN ANALYSIS OF OBJECT SORTING, BLOCK SUBSTITUTION, SYNONYMS, AND SIMILARITIES TASKS

(Publication No. 18,362)

Donald Becker Leventhal, Ph.D. University of Houston, 1956

It was the purpose of this study to extend investigations of differences in conceptual behavior between schizophrenic and brain-damaged patients, following the lead of McGaughran and Moran and of Grassi. This study was intended to: (a) determine what behavioral differences, if any, exist in the conceptual thinking of groups of schizophrenic and brain-damaged patients; (b) determine if there was an intraindividual consistency in conceptual performance as shown in the results of several concept formation tasks.

Object-sorting, similarities, synonyms, and block substitution tasks were all individually administered by one examiner to the subjects. The object-sorting, similarities, and synonyms tasks were all scored according to the method of analysis of McGaughran, while the block substitution

task was scored according to the method of analysis of Grassi. In McGaughran's conceptual schema the seven measures employed are termed: "public-open", "public-closed", "private-open", "private-closed", "total public", "total closed", and "autistic index", respectively. In the conceptual schema of Grassi the five basic measures employed are termed: "difficult-abstract", "simple-abstract", "difficult-concrete", "simple-concrete", and "total score", respectively.

Subjects utilized were 60 patients at Topeka State Hospital, Topeka, Kansas. Psychiatric diagnosis served as the criteria for the selection of the patients. Thirty patients diagnosed as schizophrenic reaction, paranoid type, and who had been in the hospital for at least two years made up the schizophrenic group. Thirty patients diagnosed as chronic brain syndrome, without psychosis, associated with arteriosclerosis, senile brain disease, alcoholism, brain trauma, or central nervous system syphilis comprised the brain-damaged group. The two groups were matched for age and educational level. Intelligence was estimated by use of the vocabulary subtest of the Wechsler-Bellevue Intelligence Scale, and the effects of this factor on conceptual behavior were removed statistically by means of a covariance analysis.

The results were interpreted to confirm the major hypotheses; the previous findings of McGaughran and Moran were, in general, verified by the results of this study. However, the block substitution task yielded results generally inconsistent with those hypothesized. On both the object-sorting and similarities tasks, five of the six measures for which hypotheses were attempted yielded results in the predicted direction; five of these measures on the object-sorting task and four of these measures on the similarities task demonstrated mean differences significant at the .01 level or better. Non-predicted mean differences were found on the public measures on both tasks. The synonyms task failed to yield the predicted mean differences on the closed measure. The block substitution task yielded significant mean differences on both of the concrete measures rather than on the abstract measures, as had been predicted.

The major finding of the study was that the schizophrenics were more "open" and the brain-damaged patients were more "closed" in their order of conceptual classification. The schizophrenic group displayed conceptual behavior consistent with Cameron's description of the schizophrenics' loss of social communication, while the braindamaged patients manifested a deficit consistent with that discussed by Goldstein and others in terms of a loss of the "abstract attitude". In general, the schizophrenics' conceptual behavior tended to be all encompassing and without boundaries, while the brain-damaged group's conceptual behavior was overcontroled and curtailed to the point of creating artificial boundaries. Another important finding was that individual subjects demonstrated consistency in terms of their conceptual behavior across the objectsorting, similarities, and synonyms tasks.

The failure of the block substitution task to yield predicted group differences may be related to the fact that all of its measures are highly correlated with each other and with estimated intelligence. Thus, it seems likely that neither of the two projected variables can be used to make group distinctions which assume the independence of one variable from the other. 113 pages. \$2.00. Mic 57-1084

INTERRELATIONSHIPS AMONG MMPI VARIABLES, KINESTHETIC FIGURAL AFTEREFFECT, AND REMINISCENCE IN MOTOR LEARNING

(Publication No. 18,426)

Manfred John Meier, Ph.D. The University of Wisconsin, 1956

Supervisor: Assistant Professor Horace A. Page

1. The purpose of this investigation was to test predictions embracing interrelationships among kinesthetic figural aftereffect, reminiscence in inverted alphabet printing, and personality variables based on the MMPI.

2. A set of hypotheses was derived from premises based on the empirical findings of earlier related research and Hull's concept of reactive inhibition postulated for in-

dividual differences.

3. The methodology utilized large sampling techniques and correlational analysis. 128 white male veterans from two VA hospitals in the state of Wisconsin served as subjects. A number of measures were obtained for each subject: (a) the amount of reminiscence in inverted alphabet printing, (b) the pre-rest and post-stimulation magnitude of a kinesthetic figural aftereffect following tactile stimulation, (c) Shipley-Hartford Scale vocabulary score, (d) MMPI responses and profiles, (e) identifying data.

- 4. In general, the results supported the hypothesis under examination. It was demonstrated that (a) the amount of reminiscence varies negatively with the magnitude of the pre-rest and post-stimulation kinesthetic figural aftereffects, (b) two MMPI scales, independently developed on the basis of their empirical relationships with the amount of reminiscence in inverted alphabet printing, correlated with reminiscence upon cross-validation, (c) these scales related with the kinesthetic figural aftereffect measures in the predicted direction but to a statistically insignificant extent, (d) MMPI profile types, independently validated for their relations with the reminiscence measure, yielded statistically, significant predictions of reminiscence scores upon cross-validation, (e) size of vocabulary varied with the amount of reminiscence and the KAE measures in accord with prediction, (f) age varied with the amount of reminiscence and the kinesthetic figural aftereffect in accord with prediction, but the correlations did not reach statistical significance for age and kinesthetic aftereffect
- 5. Reminiscence score and kinesthetic aftereffect measures were analyzed with respect to psychiatric classification. These results were discussed for their relevance to earlier research.
- 6. The general conclusion drawn from the findings was that some central variable probably underlies the demonstrated correlations. The cortical inhibition hypothesis of Eysenck and the cortical conductivity hypothesis of Klein and Krech were presented as the kinds of theories currently being entertained in this regard. Since Ir was an important construct in the derivation of hypotheses in the present study, it was felt that reminiscence warrants further investigation in the investigation of individual differences.
- 7. Some proposals for further research were outlined. Studies are already being carried out to determine the empirical validity of some of the implications of this

investigation for individual differences in perception, learning, and personality. 74 pages. \$2.00. Mic 57-1085

A COMPARATIVE INVESTIGATION OF PERSONALITY FACTORS ASSOCIATED WITH APPROPRIATE AND INAPPROPRIATE LEVELS OF VOCATIONAL ASPIRATION

(Publication No. 20,002)

Martin Reisner, Ph.D. New York University, 1956

The Problem

The purpose of the investigation was to assess the differences in personality between clients in a vocational guidance center who aspire to appropriate vocational goals in terms of their abilities and those who entertain inappropriate vocational aspirations. The specific problems of the study were:

1. Are there any significant personality differences between over-aspirants and those whose aspiration levels

seem appropriate?

2. What differences in personality, if any, exist between under-aspirants and those aspiring to appropriate levels?

3. Are there any significant differences in personality between over-aspirants and under-aspirants?

4. To what extent does the combined group of overaspirants and under-aspirants differ in personality from clients entertaining appropriate aspirations?

5. To what extent is the appropriateness of the vocational aspirations level related to the various traits of personality?

Procedure

1. A stimulus question was formulated to elicit an objective statement of vocational aspirations and incorporated into the guidance summary form routinely filled out by each client prior to his preliminary interview. A test battery suited to the client's needs was recommended by the interviewer to include tests of abilities, aptitudes, interests and the measure of personality chosen for the study, the G-Z Temperament Survey.

2. During the conferences on each case following the testing process the judges classified the aspiration response and assigned it to a level on the Occupational Hierarchy Scale devised for the study. They also evaluated the appropriateness of the vocational aspiration level in terms of the client's abilities as a result of which each client was assigned to the Appropriate, Over-Aspirant or

Under-Aspirant groups.

The data were treated in the following manner:

Mean scores for the ten personality traits, ability and aptitude variables and other factors such as Level of Interests, Father's Occupational Level and two measures of personal adjustment were computed for the Appropriate, Over-Aspirant, Under-Aspirant and combined Inappropriate groups (Over-Aspirants plus Under-Aspirants). The groups were compared by analysis of variance which was followed up, where indicated, by t-tests to assess the statistical significance of the observed differences between

the respective means. Biserial correlation coefficients were computed to assess the degree of association between the factor of appropriateness and certain factors such as personality traits, abilities and aptitudes, and the measures of adjustment.

Results

Significant differences on the Emotional Stability and Masculinity Scales were found between the Appropriate and Over-Aspirant groups, with the Appropriate group having the higher mean score in each instance. Both the Appropriate and Over-Aspirant groups exceeded the Under-Aspirant group significantly on the Ascendance Scale. The Appropriate group scored significantly higher than the combined Inappropriate group on the Emotional Stability and Masculinity Scales. Low, positive but significant biserial correlations were found to exist between the appropriateness of the vocational aspiration level and traits Emotional Stability and Masculinity.

The Appropriate group was substantially and significantly superior to the Over-Aspirant group in general intelligence, ability to deal with spatial relations, mechanical comprehension and clerical aptitude involving verbal material. This was also true of the differences between the Appropriate and combined Inappropriate groups for these factors. The Under-Aspirant group exceeded the Over-Aspirant group significantly in general intelligence and mechanical comprehension.

The Appropriate and Over-Aspirant groups were both significantly higher on the Level of Interests scale of the Lee-Thorpe Occupational Interest Inventory than the Under-Aspirant group. These differences corresponded closely to the differences between the respective groups for level of vocational aspiration.

Although no significant differences were found to exist among the Appropriate, Over-Aspirant and Under-Aspirant groups in terms of the father's occupational level, the Appropriate group was slightly but significantly higher than the combined Inappropriate group in this respect. The Appropriate and Over-Aspirant groups were also found to choose occupational levels substantially and significantly higher than those of their fathers.

The results for both measures of personal adjustment based on certain scales of the personality inventory were identical. Although no significant differences were found among the Appropriate, Over-Aspirant and Under-Aspirant groups, there was a small but significant difference between the Appropriate and combined Inappropriate groups in favor of the former.

Conclusions

The findings of this study in terms of significant differences in personality traits, ability and other factors should be interpreted within limits inherent in the method employed to assess the appropriateness of the vocational aspiration level, the tests used and the type of population studied. The results need to be validated in further studies of different populations employing suitable techniques.

127 pages. \$2.00. Mic 57-1086

THE EFFECTS OF VERBALLY CONDITIONED RESPONSE CLASSES ON POST-CONDITIONING TASKS

(Publication No. 19,475)

Barbara Ryrholm Sarason, Ph.D. Indiana University, 1956

This study included two experiments. Both were designed to investigate the problem of whether, once response characteristics of Ss are altered by verbal conditioning, this alteration persists when the reinforcement ceases and when the stimulus situation is modified. In Experiment I a free word naming interval was used before and after conditioning as a variant of the task used for the conditioning series. In Experiment II a recognition task was substituted for the free word naming.

The Ss were 120 general medical patients in an acute treatment Veterans Administration hospital.

The task presented to them consisted of a series of multiple choice situations in which the S was to select one of three verbs presented to him. The E had previously selected these verbs so that they fell into three categories. These were verbal activity verbs, bodily activity verbs, and neutral verbs. The verbs in the first two categories constituted the reinforced class verbs. Only two categories of verbs, neutral and either verbal or bodily activity, were used for a single S. After an initial period to determine individual preference for the various verbs, 140 trials were given in which E reinforced S by saying "mmhmm" each time S chose a reinforced class verb. After this task was completed, one of the post-conditioning tasks outlined above was presented to S.

Changes in response characteristics were studied in terms of a number of measures. In order to give the results more generalizability, the stimuli presented to the groups of Ss in the conditioning series included two different reinforced classes and two different lists of words for each of these classes.

The main findings resulting from the experiments may be summarized as follows:

- a. The response characteristics of <u>Ss</u> reinforced during the conditioning series differed from those of nonreinforced <u>Ss</u>. Thus learning occurred in the verbal conditioning situation.
- b. This alteration in response characteristics of the reinforced Ss continued after explicit reinforcement had ceased and the task presented to S had been altered.
- c. Responses most like those conditioned showed the greatest proportionate increase in the post-learning period. The less similar the response to the class initially conditioned, the less the relative increase which was observed. Thus a definite indication of a gradient effect was observed.
- d. In general the results outlined under a., b., and c. above were obtained regardless of the particular reinforced class chosen by E and the particular words in this class which were used in the conditioning series. Thus some generality may be assumed for these findings.

These present results were felt to raise a number of questions for further research. In general these fall under two headings:

- a. How much can the post-conditioning task differ from the conditioning series before changes in response characteristics disappear.
- b. What are the factors operating in the experimental situation which effect the strength of verbally conditioned response tendencies and by inference also the degree of generalization of the response.

98 pages. \$2.00. Mic 57-1087

PSYCHOLOGY, EXPERIMENTAL

THE EFFECT OF MANIFEST ANXIETY UPON INCIDENTAL AND NEW TASK LEARNING

(Publication No. 19,740)

Mary Irene Duwall, Ph.D. George Peabody College for Teachers, 1956

Major Professor: Nicholas Hobbs

The present study was designed to test the effect of varying levels of manifest anxiety upon incidental and new task learning and to determine the degree of relationship between the two types of learning. The experiment was also designed to test Hull's formulation concerning the relationship of drive and performance in complex learning. More specifically, it was predicted that a negative relationship would be found between level of anxiety and performance in the two learning situations. A positive relationship was predicted between incidental and new task learning performance.

On the basis of anxiety scores obtained upon the Taylor Manifest Anxiety Scale, a total sample of 186 college freshmen was divided into three groups of 62 Ss each. These groups were considered to be representative of a low, moderate, and high anxiety level. The level of anxiety was assumed to be a reflection of underlying drive level (D). Performance scores were obtained for each S in both intentional and incidental learning situations. Scores on the American Council on Education Psychological Examination for College Freshmen demonstrated that the Ss with low anxiety scores were superior in intelligence to the Ss with high anxiety scores. Therefore, the groups were equated in intelligence by a covariance adjustment when the data were analyzed.

The results were that level of manifest anxiety did not influence performance in complex learning situations under either intentional or incidental learning conditions. A low positive but significant relationship was found between incidental and new task learning.

The possibility that these results contradict Hull's position was considered. Alternate explanations which were not incompatible with Hullian theory were offered. It was concluded that if any one of the alternative explanations was correct, then the conclusion that the results are contradictory to the Hullian formulation was not a completely tenable one.

Suggestions were presented regarding further research in incidental learning. Research aimed at the personality

characteristics of Ss who demonstrated proficiency in incidental learning was proposed. It was also suggested that future experimental designs investigate the factor of intelligence when selecting Ss on the basis of Taylor scores, since difference in intelligence between low and high anxiety groups were demonstrated in this study and several others.

114 pages. \$2.00. Mic 57-1088

THE BEHAVIORAL EFFECTS OF SOME TEMPORALLY-DEFINED SCHEDULES OF REINFORCEMENT

(Publication No. 20,055)

Eliot Sanford Hearst, Ph.D. Columbia University, 1956

An attempt was made to show how classically-defined interval and ratio schedules may be viewed as special cases of one general conceptual framework employing certain temporal parameters as its major independent variables. The terms t^D and t^\triangle were used to refer, respectively, to time periods during which (a) reinforcement may be given and (b) reinforcement is never given. The simplest cases arise where t^D and t^\triangle are held constant and are alternated, and only the first response in t^D is reinforced.

Within this context the present study sought to examine the behavioral effects of changes in the length of t^D while holding cycle length (t^D+t^\triangle) constant. Procedurally, this amounted to making reinforcement available for only a limited time (t^D) at the close of a fixed interval of time (t^D+t^\triangle) ; if a response did not occur within this limited period, no further responses were reinforced until the next t^D was scheduled. The independent variable was specified in terms of the ratio $t^D/(t^D+t^\triangle)$, or \overline{T} , which indicates the proportion of the cycle during which a response may be reinforced.

Four White Carneaux pigeons were the subjects, while the response employed was key-pecking. Each bird began on a schedule where $\overline{T}=1.00$ and thereafter was successively shifted to \overline{T} 's of .35, .05, .03, .02, and .013; stable behavior on a certain \overline{T} value was the criterion for moving a subject to the next value of \overline{T} . Cycle length was held constant at thirty seconds throughout the study.

Results:

- 1. Response rates and responses per reinforcement increased with positive acceleration as \overline{T} decreased. The group function for each of these measures showed a possible discontinuity, with linear components on either side of $\overline{T}=.03$.
- 2. Response rate was inversely related to frequency of reinforcement; on \overline{T} values where the greatest number of reinforcements were "missed", response rates had their most pronounced increase. On the lowest \overline{T} values, two birds evidenced "strain" analogous to that often obtained under high fixed-ratios.
- 3. Distributions of interresponse times (IRT's) immediately after (initial) and immediately preceding (terminal) reinforcements both revealed an increase in the relative frequency of very short IRT's and a decrease in the relative frequency of longer IRT's as \overline{T} decreased. The percent difference between initial and terminal rates decreased

as $\overline{\mathbf{T}}$ decreased; this change was mirrored in the shapes of cumulative response curves as well.

- 4. Short IRT's greatly outnumber long IRT's for all values of \overline{T} , probably because there are more opportunities for short IRT's to occur. When the number of IRT's in each IRT class is corrected for number of opportunities (yielding the measure IRT's/ops), it is found that on high \overline{T} values the separate IRT classes do not differ much in IRT's/ops; as \overline{T} decreases, however, shorter IRT's become much more likely than long IRT's.
- 5. A probabilistic treatment of the IRT data does not support the assumption of a random distribution of responses in time.

Conclusion:

Manipulation of $\overline{\mathbf{T}}$ values in the present study led to a change in response properties from those generally seen under interval schedules to those most often seen under ratio schedules. Thus, the data are in substantial agreement with the proffered argument that both types of schedule may be integrated within a single framework of temporally-defined variables. Several suggestions were made as to further isolation of the factors controlling the shift from "interval" to "ratio" behavior.

95 pages. \$2.00. Mic 57-1089

THE EFFECT OF AMOUNT AND TIMING OF KNOWLEDGE OF RESULTS UPON LEARNING A MOTOR SKILL

(Publication No. 19,748)

Joseph Clyde Johnson, Ed.D. George Peabody College for Teachers, 1956

Major Professor: Robert A. Davis

The purpose of this experiment was to test the effect of amount and temporal position of knowledge of results upon learning a perceptual-motor skill. The skill used in the experimental situation involved learning to move an unseen knob as nearly eight inches as possible. Each of the 175 adult, male, college students who served as subjects attempted to acquire proficiency in the skill while working as a member of one of seven groups. The groupings were made according to the manner in which knowledge of results, as given by the experimenter, was varied. Group A was given knowledge of results by means of nine lights, designed "more" knowledge of results, immediately after the completion of each trial; Group B was given "more" knowledge of results two minutes after each trial; Group C was given "more" knowledge of results four minutes after each trial; Group D was given knowledge of results by means of three lights, designated "less" knowledge of results, immediately after the completion of each trial; Group E was given "less" knowledge of results two minutes after each trial; Group F was given "less" knowledge of results four minutes after each trial; and Group G was given no knowledge of results at any time. There was an interval of four minutes duration after each trial.

These experimental conditions were developed to test the following hypotheses.

Hypothesis 1. The perceptual-motor skill will be

acquired where there is knowledge of results and will not be acquired where there is no knowledge of results.

Hypothesis 2. The performances of the subjects working under conditions of "more" knowledge of results—Groups A, B, and C—will be superior to the performances of the subjects working under conditions of "less" knowledge of results—Groups D, E, and F.

Hypothesis 3. Subjects receiving less delay of knowledge of results than other subjects will perform better on

the perceptual-motor task.

Hypothesis 4. There will be a significant interaction of the effects of amount and temporal position of knowledge of results. Specifically, subjects receiving "more" knowledge of results will react to conditions of temporal delay more favorably than subjects receiving "less" knowledge of results. On the other hand, subjects receiving "less" knowledge of results will benefit more from having this knowledge immediately.

Two criteria of learning the perceptual-motor skill were used. They were (1) distance from the standard movement of eight inches; (2) the number of "hits" scored by each subject.

The results of the experiment were such that Hypotheses 1 and 2 were found to be tenable. On the other hand, Hypotheses 3 and 4 were not supported by the data.

89 pages. \$2.00. Mic 57-1090

ACQUISITION AND EXTINCTION OF A RUNNING RESPONSE AS A FUNCTION OF THE PERCENTAGE OF REINFORCEMENT AND THE NUMBER OF ACQUISITION TRIALS

(Publication No. 20,305)

John Koehler, Jr., Ph.D. Tulane University, 1956

Chairman: E. J. Hovorka

The purpose of this study was to investigate the relationship between percentage of reinforcement and number of acquisition trials on the acquisition and extinction of a running response. From a review of the partial reinforcement literature, Jenkins and Stanley1. concluded that a partially reinforced response is acquired more slowly than one which is continuously reinforced. However, the findings of a number of partial reinforcement runway studies are of questionable value as supporting data for this conclusion due to confounded variables; the findings of others also are in disagreement with it. The reviewers also came to the conclusion that a partially reinforced response is more resistant to extinction than one which is continuously reinforced. Some partial reinforcement studies did not find this difference in resistance to extinction after a few acquisition trials, which suggests a possible interaction between percentage of reinforcement and amount of

The present study was done with a 2 x 5 factorial design, having 10, 20, 40, 80, and 160 acquisition trials at 50% and 100% reinforcement levels. Ten albino and hooded male rats were assigned randomly to each of the experimental conditions. The animals were run 10 trials per

day, with an intertrial spacing of 150 seconds, in an 8-foot straight alley. At the time of running, all animals were water deprived 21 hours.

The following measures of acquisition and extinction were treated in separate analyses of variance. The acquisition measures were the mean log latency and the mean reciprocal running time of the final 7 acquisition trials for each animal. The extinction measures were (1) the difference score of the mean log latency of the final 7 acquisition trials and the mean log latency of the 4th through 10th extinction trials, (2) the difference score of the reciprocal running time means of these same trials, and (3) the log number of extinction trials to a 60-second running-time criterion: each of these measures was obtained on each animal.

The results and conclusions of this study were the following.

1. The 100% reinforcement animals did not start or run any faster than the 50% animals at any of the five acquisition-trial levels during acquisition. The results of the analyses of variance for both log latency and reciprocal running time showed the percentage of reinforcement and its interaction with the number of acquisition trials insignificant.

These findings do not support the conclusion that a response is acquired more slowly under partial than under continuous reinforcement.

2. The 50% reinforcement animals were more resistant to extinction than 100% reinforcement animals, in terms of the difference score extinction measures. The results of the analyses of variance for both log latency difference scores and reciprocal running time difference scores showed significant differences at the .01 level (two-tailed) between reinforcement groups.

No reliable differences were obtained in the analysis of variance between 50% and 100% reinforcement groups on the extinction-to-a-criterion measure. However, four of the five differences between means and five of the five differences between medians of corresponding reinforcement groups at each acquisition-trial level were in the direction of greater resistance to extinction for the 50% groups. The one exception to this trend was a small reversal in the 10-acquisition-trial animals.

In general, these findings support the conclusion that a response is more resistant to extinction after partial reinforcement in acquisition than after continuous reinforcement

3. The 50% reinforcement animals were more resistant to extinction than the 100% reinforcement animals after 20 acquisition trials. The reinforcement groups were not different in resistance to extinction after 10 acquisition trials.

The results of analyses of variance for both log latency and reciprocal running time difference scores showed the differences between reinforcement groups receiving 20 acquisition trials to be significant. These differences were not significant for reinforcement groups receiving 10 acquisition trials.

These findings indicate that the minimum amount of training needed before 50% reinforcement animals are more resistant to extinction than 100% animals is below 20 acquisition trials. 34 pages. \$2.00. Mic 57-1091

1. W. O. Jenkins and J. C. Stanley, Jr. Partial reinforcement: a review and critique. Psychol. Bull., 1950, 47, 193-234.

INFERENTIAL LEARNING IN RATS: THE PROBLEM-SOLVING ASSEMBLY OF BEHAVIOR SEGMENTS

(Publication No. 18,690)

Chris Koronakos, Ph.D. The University of Nebraska, 1956

Adviser: William J. Arnold

The aim of this study was to investigate the role of the rg as it functions in the mediation of inferential learning in rats. Six hypotheses derived from Hullian behavior theory were tested. Hypothesis 1 stated that a rat, having established several habits, would demonstrate the capacity to combine two of these habits into a sequence in order to achieve a major goal. Hypothesis 2 predicted that an experimental group, on the first test for inferential learning, would demonstrate a longer mean latency at the junction of the combined segment than would a control group that learned the sequence as a complete unit. Hypothesis 3 hypothesized that this experimental group would show a gradual decrease in the mean latency at this junction point as a function of rewarded trials. Hypothesis 4 predicted that the behavior sequence would be progressively strengthened in the course of additional reinforcements. Hypothesis 5 stated that the occurrence of inferential behavior would be enhanced as a function of prefeeding the rat prior to the critical test trial, and Hypothesis 6 predicted that inferential behavior would not occur if the habits leading to the subgoals were established before the habit leading to the major goal was formed.

The subjects were 91 experimentally naive pied rats 110 to 208 days of age. The apparatus was an enclosed maze which consisted of three goal boxes and one starting box connected by three enclosed pathways. Each box was made distinctive in shape, color, flooring and construction in order to offer the rats widely different sensory stimuli and to evoke in them differing reactions while in the boxes.

Four experiments were conducted, each designed to test one or more hypotheses. Experiment I tested the first four hypotheses with small versus large food reward; Experiment II tested these same hypotheses with large food reward versus water reward; Experiment III tested hypothesis 5 with prefeeding prior to the initial test; and Experiment IV tested hypothesis 6 with an order of training the reverse of that employed in the three previous experiments.

Although there were some differences in terms of such factors as amount of training over each segment, extablishment of a learning criterion, massed versus distributed training, etc., the training procedures were basically similar for all experiments. The basic paradigm was that each rat was given a series of reinforced trials over each segment. Two habits led to subgoals, while the third habit led to the major goal. The criterion of inferential behavior was defined as a significant proportion of rats choosing the path leading to the major goal on the first test trial.

The results of these experiments fail to provide statistically reliable evidence confirming those hypotheses primarily derived on the basis of the r_g (hypotheses 1, 5, and 6). There was no evidence of inferential behavior in rats.

Learning to solve problems inferentially was assumed to be the result of the combined effects of trial and error practice and inferential learning as mediated by \mathbf{r}_g 's. In

the present study the learning that was observed to occur was interpreted as simple trial and error; there was no evidence that learning occurred when theoretically only the $r_{\rm g}$'s were involved.

Several factors were discussed which were believed to have some influence in the failure to obtain clear evidence of inferential behavior in this study. These factors were presented in terms of training variables, experience variables, learner variables, and task variables.

64 pages. \$2.00. Mic 57-1092

THE EFFECT OF THE AMOUNT AND DISTRIBUTION OF WARMING-UP ACTIVITY ON ORIGINAL LEARNING AND RETENTION

(Publication No. 20,306)

Robert Irvin Long, Ph.D. Tulane University, 1956

Chairman: Arthur L. Irion

This study was designed to measure the effects of the amount and distribution of a warming-up activity on the original learning (OL) and the relearning (RL) of a list of 10 nonsense syllables by the serial anticipation method. The purpose of this study was to provide additional empirical evidence concerning the role of the warming-up effect in OL and RL. The warming-up task (digit naming) consisted of the recitation of 10 three-place numbers presented on a memory drum in the same manner as the nonsense syllables.

Ten groups of 20 subjects each received 10 trials of OL. Four of these groups had 5 massed, 5 distributed, 10 massed, or 10 distributed trials of digit naming prior to OL with no RL. One control group had 10 more trials of learning immediately with no rest interval. A second control had 10 trials of RL after 48 hrs. with no warm-up. The remaining four groups received the same conditions of digit naming as the OL groups except that it was given 48 hrs. after OL and immediately prior to 10 trials of RL. The subjects were not told the purpose of the digit naming. The massed trials of digit naming were presented with a 6-sec. intertrial interval as were the nonsense syllables, while the distributed trials had an intertrial interval of one min.

The results of this study were contradictory in that the beneficial effects of digit naming were clearly demonstrated for OL but not for RL. While the digit-naming activity prior to RL tended to improve performance on RL, the differences over the control group receiving no warmup were not statistically significant. Nevertheless, since continued improvement in performance was noted with increasing amounts of digit naming, it was suggested that a further increase in the number of digit-naming trials might have resulted in a significant improvement in RL. The spacing of the digit-naming trials did not result in better performance on either OL or RL. On OL 10 trials of digit naming tended to be more beneficial than 5 trials although the difference was not statistically significant. This was also true for RL in the case of massed warmingup but under distributed conditions 10 trials of digit naming was less beneficial than 5 trials.

The discrepancy between the OL and RL results was explained in terms of the fact that the RL groups had had more prior practice (10 trials of OL) than the OL groups which had had none and, therefore, had presumably learned more postural and attentive adjustments for optimal performance which means they had more to lose during the rest interval. It follows from this that more warming-up might be required to reinstate set for optimal performance in the RL groups.

36 pages. \$2.00. Mic 57-1093

AN ANALYSIS OF INTER-PERSON CORRELATIONS AMONG THIRTY PSYCHOTICS

(Publication No. 20,060)

Vincent Sebastian Machi, Ph.D. Columbia University, 1956

A study was undertaken in order (1) to determine if, among chronic psychotics, there exists a "psychometric type" with a high probability of recovery, and (2) if so, to describe this "psychometric type."

The subjects were 30 chronic psychotics of the Columbia-Greystone study, 11 of whom were classified as "recovered" as of May 5, 1954.

A matrix of the inter-person correlations among all subjects based on above-median scores on 66 psychological test measures was factor analysed by Thurstone's complete centroid method. Four factors were extracted. They were rotated to maximize the projection of the "recovered" group on one factor, while minimizing its projection on all other factors. The conclusions drawn from the analysis are as follows:

- 1. Among chronic psychotics there exists a "psychometric type" with a better than-chance probability of recovery. This type is not distinguished by diagnosis, age, sex, or duration of illness.
- 2. The type is characterized by generally poor performance on intellectual tasks, long reaction times and poor time estimation.
- 3. Among patients of this type, those who recover perform better than those who do not on perceptual tasks requiring new learning, while those who do not recover perform better than those who do on verbal-conceptual tasks depending on previous learning.

44 pages. \$2.00. Mic 57-1094

PERSONALITY DIFFERENCES BETWEEN
VOLUNTEERS AND NON-VOLUNTEERS FOR
PSYCHOLOGICAL INVESTIGATIONS:
SELF-ACTUALIZATION OF VOLUNTEERS AND
NON-VOLUNTEERS FOR RESEARCHES IN
PERSONALITY AND PERCEPTION

(Publication No. 19,999)

Michael Newman, Ph.D. New York University, 1956

The purpose of this investigation was to evaluate and compare volunteers and non-volunteers for two types of psychological research (perception and personality) in three aspects of self-actualization (autonomy, democratic character, and intraception).

The sub-problems involved:

684

Evaluation of the three facets of self-actualization in every group. For this, means and standard deviations were computed.

Comparison of volunteers with non-volunteers, and perception volunteers with personality volunteers in variability. Variance ratios were calculated for this.

Comparisons delineated in previous paragraph of means. Student's "t" was determined for this; where variances were not homogeneous, significance ratios were evaluated by Cochran-Cox formula.

The hypotheses were that:

Volunteers would be more self-actualizing than non-volunteers.

Personality volunteers would be more self-actualizing than perception volunteers.

The subjects were two hundred ninety-two females and one hundred seventy-nine males in Brooklyn College elementary psychology classes.

The perception and personality groups were equated in age and class. The investigator made each appeal for volunteers in the same words. From one to two months later, the instructors administered the tests to their classes, purportedly as a course exercise with no apparent connection with this research.

The tests used were Form 40/45 of the F (Fascism) Scale, and nine perinent variables of the Edwards Personal Preference Schedule: Deference, Autonomy, Intraception, Succorance, Abasement, Nurturance, Change, Heterosexuality, and Aggression.

Conclusions

The conclusions which may be drawn from and limited to the methods and population of this investigation follow. These inferences may, of course, be applicable only to similar populations and methods.

1. There is a tendency for male non-volunteers to be more variable than volunteers, but the differences are not statistically significant.

2. The trend, not statistically significant, is for the female volunteers to be more variable than the non-volunteers in self-actualization.

3. The female non-volunteers are very significantly more variable in age than the volunteers.

4. The volunteers for perceptual research and the volunteers for personality research are equally variable in self-actualization.

- 5. The female personality volunteers are very significantly more variable than the perception volunteers in age and class.
- 6. There is a strong tendency, nearly statistically significant, for the male perception volunteers to be more autonomous than the non-volunteers.
- 7. Other than the trend noted in Conclusion 6, there are no differences in self-actualization among the various groups which come close to being statistically significant.
- 8. There are no significant differences between the perception groups in age or class.
- 9. The male personality non-volunteers are significantly older and higher in class than the volunteers.
- 10. The female personality non-volunteers are significantly older than the volunteers, and almost significantly higher in class.
- 11. An appeal for volunteers for personality research results in a more representative sample of subjects, particularly among the males, than does an appeal for volunteers for perceptual research, as far as self-actualization is concerned.
- 12. A request for volunteers for perceptual study brings a more representative response in age and class than does an appeal for volunteers for personality research, especially with males.
- 13. The volunteers and non-volunteers are not sufficiently equal to justify indiscriminate and unqualified use of volunteers as representative of the total population in every respect.

 106 pages. \$2.00. Mic 57-1095

NEED, RELEVANCE OF IDEATION, FORCE AND TIME ESTIMATION

(Publication No. 19,212)

Peter Michael Schönbach, Ph.D. University of Minnesota, 1956

The results of an exploratory study by Schachter on effects of social isolation suggested two hypotheses:

- 1. The force acting on a person at time t to reach a goal G is an increasing function of the person's need for G "times" the relevance of this person's ideation immediately preceding t.
- 2. The greater within limits the magnitude of the force acting on a person in a barrier situation to reach a goal, the greater will be this person's estimate of the time spent in that barrier situation.

From these hypotheses the following predictions were derived and tested in an experiment:

- 1. With need for food held constant at a high level, the force to eat in a person exposed to relevant stimulation will be stronger than the force to eat in a person exposed to irrelevant stimulation. With need held constant at a low level, the force to eat in a person exposed to relevant stimulation will not be (or not appreciably be) stronger than the force in a person exposed to irrelevant stimulation.
- 2. The stronger within limits the force to eat in a person in a situation in which eating is impossible, the greater will be this person's estimate of the time spent in that situation.

The experiment. Female students arrived, one at a

time, for an experiment in "food tasting" either hungry (High Need) or satiated (Low Need) according to instructions received. The experimenter announced a delay of the tasting due to necessary preparations and asked the subjects to perform a task during his absence. Twenty High Need and 20 Low Need subjects rated recipes (Relevant Stimulation); another 20 subjects in each Need condition rated fashion designs (Irrelevant Stimulation). After 13 minutes the experimenter returned with a questionnaire asking for an estimate of the length of the delay period, and for indications of feelings about time passage, liking of the task, extent of thinking about food, desire to taste and feelings of hunger. A table with cookies was then placed before the subject with the instruction to eat as much as she wanted. After rating the cookies the subject was again left alone for 13 minutes, this time with a puzzle game. Time estimates for this period were obtained for comparisons with the delay period estimates. Consumption of cookies and answer scales for the questions on desire to taste and hunger feelings served as measures of the force to eat.

Conclusions. The data strongly support the first hypothesis. Theoretical and practical implications of this finding were discussed in the light of the persistent ruminations about food in starving persons.

Strong support was also obtained for the following derivation from both hypotheses: "High Need subjects after relevant stimulation should give higher time estimates for the delay period than High Need subjects after irrelevant stimulation. Little or no such differences should be expected for subjects in a state of low need."

A second derivation was: "High Need subjects after relevant stimulation should give higher time estimates for the delay period than Low Need subjects after relevant stimulation. Little or no such differences should be expected with subjects after irrelevant stimulation." On the whole the data tend to confirm this derivation, but some discrepancies between the expected and the observed relationships exist. Tentative explanations of these discrepancies were suggested.

An alternative interpretation of the time estimation results in terms of liking of the rating task was considered together with the design of an experiment which would furnish a test of our hypothesis versus this interpretation.

84 pages. \$2.00. Mic 57-1096

SOME EFFECTS OF VARYING CONTROL-DISPLAY RELATIONSHIPS IN A DISCRETE TRACKING TASK

(Publication No. 19,871)

James Robert Skeen, Ph.D. University of Illinois, 1956

This study investigated the effects of three variables, control sensing, display plane, and control plane, and their interactions, on performance in a discrete tracking task. Two values of the sensing variable, isomorphic and reverse, were used. The horizontal plane, the vertical plane, and the forty-five degree plane between them were utilized as the control and display planes.

One hundred and eighty first year AFROTC cadets were divided into eighteen groups of ten subjects each, in a simple factorial design. Ten blocks of trials on the task were given successively. The performance measures were based on the last three blocks.

The data for the sensing variable showed superior performance under the Sensing Two or reversed sensing condition in terms of reversal errors and response latencies. Sensing One was superior in terms of measures reflecting accuracy of directional guidance. The display plane variable contributed little to performance differences. The control plane data showed no differences in performance between the horizontal control plane and the forty-five degree control plane. The differences between the combined horizontal and forty-five degree control plane groups and the vertical control plane group were highly significant on the measures reflecting accuracy of directional guidance, with the vertical control plane being inferior to the other two planes in this respect. Only three interactions were significant, and no consistent information was provided by these.

The results were discussed in terms of previous sensing studies. It was concluded that contrary to the prior indication that the isomorphic sensing is superior in both following and compensatory tracking, the present results indicate that for discrete compensatory tasks at least, other factors may interact with sensing. The role of uniqueness of identification of display elements and the possible variables involved in this factor were briefly considered. An explanation of the inferiority of the vertical control plane was suggested in terms of hand positions in manipulating the control. 123 pages. \$2.00. Mic 57-1097

RELIGION

RUFUS M. JONES AND THE CONTEMPORARY QUAKER VIEW OF MAN

(Publication No. 20,030)

Wilmer Albert Cooper, Ph.D. Vanderbilt University, 1956

Supervisor: Professor Nels F. S. Ferré

Any social philosophy or philosophy of history finally depends upon its assumptions about the nature and hope of man. Thus a critical analysis of Quaker social thought presupposes a careful study of the Quaker view of man.

Rufus M. Jones has probably had more influence on twentieth century Quaker thinking than any other single member of the Society of Friends. Because of his wide influence and because he wrote widely and lends himself to research, he serves as our best introduction to a study of the contemporary Quaker view of man.

Rufus Jones was deeply rooted in mystical religion and Platonic philosophy. He was also influenced by Kantian ethics and the liberal tradition of the nineteenth century. Coupled with this was a keen interest in psychology and the scientific approach. His method was empirical and he had a profound respect for reason.

Though Jones believed in the rational autonomy of man,

he also believed that man is rooted in the Life of the Spirit. His existence in space and time is but part of the continuous Life of the Beyond. Man is admitted to be a sinner, but he is not intended to remain a sinner. Because there is "that of God in every man," he may aspire to become Christ-like. There is nothing insurmountable to keep him from realizing this ideal. It is to be accomplished through a process of re-education of habit patterns, attitudes, values and thus man's entire character.

All social change is dependent upon individual change, and since such change is reasonable to expect, there is great hope for the world. The historical process may eventually be transformed into the Kingdom of God. Man's hope and the goal of life lie in the triumph of the realm of Spirit in the dimension of history. The Eternal is continually breaking into time.

Rufus Jones represented somewhat of an innovation in Quaker thought and history. He attempted to rewrite the history of Quakerism from his mystical-humanist frame of reference. He overlooked almost entirely the influence of English Puritanism and the Prophetic Tradition upon the developments of early Quakerism. His views of the nature of man and man's hope in history were unduly optimistic, and were at variance with most of his Quaker predecessors, including George Fox, Robert Barclay and Isaac Penington. Though his views came to be widely accepted in the early part of the twentieth century, the trend has begun to shift back toward a more temperate and basically Christian interpretation of man and history.

A restatement of a more adequate view of man must see him as both prone to sin and inextricably bound up in the matrix of social evil. Yet, man's situation is not hopeless. Because he is a child of God, and because of our dependence upon a living God whose love and providence prevail, man and his situation may be changed. God works not only in and through individual persons, but He works in and through the corporate relationships of men and societies to transform history. Man is a responsible instrument in the fulfillment of this process, but the process is ultimately in God's hands and not man's. Man's hope lies in the resources of God. If he responds to those resources he may be brought into the fullness of the knowledge and love and fellowship of God. This may take place here and now, where God's Time and man's time are joined together in the Eternal-Now. 349 pages. \$4.50. Mic 57-1098

THE ROLE OF THE LUTHERAN CHURCHES OF AMERICA IN THE FORMATION OF THE WORLD COUNCIL OF CHURCHES

(Publication No. 20,037)

Dorris Aldo Flesner, Ph.D. The Hartford Seminary Foundation, 1956

Five of the sixteen American Lutheran general bodies, representing about 52% of the nearly seven million Lutheran church members in the United States and Canada, are affiliated with the World Council of Churches (WCC).

The General Synod of the Evangelical Lutheran Church in the U. S. A. shared actively in early deliverations of Faith and Order but withdrew in 1917 in protest against an undue emphasis on apostolic succession and a naive attitude toward the Roman Church. The United Lutheran Church in America, which in 1920 adopted a pioneering

statement of principles dealing with cooperative Christian movements, was officially represented at Stockholm, Lausanne and Edinburgh but withdrew representation from Oxford because of Life and Work's continuing policy of coopting members. The Augustana Synod sent delegates to Stockholm, Oxford and Edinburgh and was the first American Lutheran body to join the World Council.

Lutheran churches of America affiliated with the National Lutheran Council (NLC), in cooperation with the Allgemeine Lutherische Konferenz, were largely responsible for calling the first world gathering of Lutherans which in 1923 formed the Lutheran World Convention LWC. American Lutherans in 1936 drew up a statement on "Lutherans and Ecumenical Movements" which was adopted by the LWC Executive Committee. At Utrecht in 1938 American Lutheran delegates to the WCC's constitutional conference unsuccessfully sought to have representation in the Council implemented along confessional lines. On September 6, 1945 the eight NLC churches joined in a petition for confessional representation. The LWC, renewed following World War II largely as a result of American Lutheran efforts, supported the petition. At a meeting of the WCC's Committee on Arrangements for the First Assembly an amendment was agreed upon which has completely changed the method of representation.

Three of the eight American Lutheran bodies joining in the September 1945 petition failed to move on to membership in the World Council. The Suomi Synod took no further action with reference to the Council. The Evangelical Lutheran Church and the Lutheran Free Church rejected proposals for membership on the ground that affiliation would constitute a unionism forbidden by Scripture. Holding that a formal association between churches adhering to different doctrinal positions involves a compromising of revealed truth which can only result in a confused and ineffective witness, they chose to remain aloof from the Council. The American Lutheran Church, the Augustana Synod, the Danish Evangelical Lutheran Church, the United Evangelical Lutheran Church and the United Lutheran Church in America shared in the formal organization of the World Council in 1948. This thesis deals only with the eight National Lutheran Council churches and their antecedents.

Contributions to ecumenical organization and polity which can be attributed, in part at least, to the influence of American Lutherans include: (1) the policy of "receiving" rather than "adopting" reports, which avoids the suggestion of a unity not yet achieved and enables the Council to speak out more freely in prophetic witness; (2) a reaffirmation of the representative principle which helped establish the WCC as a council of responsible churches and not just an organization of individuals interested in Christian unity; (3) a statement on the nature and purpose of the WCC in which it is clearly set forth that the Council is not nor is it to become a superchurch with centralized administrative authority; (4) the relating of all departments, divisions and agencies of the Council primarily to member churches rather than to area organizations, agencies or movements; and (5) a method of representation which gives due recognition to the confessional principle. assures full freedom of association within the framework of the Council, and more fully establishes the Council as a voluntary fellowship of churches associated for the purpose of promoting an ecumenical consciousness, cooperative study and the facilitation of joint action.

372 pages. \$4.75. Mic 57-1099

SOCIAL PSYCHOLOGY

A STUDY OF THE RELATIONSHIPS BETWEEN SELF-VIEWS AND ROLE-TAKING ACCURACY

(Publication No. 12,888)

Carl James Couch, Ph.D. State University of Iowa, 1955

Chairman: Professor Manford H. Kuhn

Although the concepts "self" and "role-taking" are crucial to the symbolic interaction approach to social psychology, neither has been used to any extent in research. The purpose of the present research was to discover the possible associations between self-views and the role-taking process. The instruments used to identify and measure self-views were the Kuhn-McPartland Twenty-Statements Test and the Stewart Objects Test. The instruments used to measure role-taking were constructed by the present author around an experimental pair-interaction situation involving, in pre-test, 18 pairs of subjects, and, in the main study, 49 pairs of subjects. Members of each pair were volunteers from a large social science core course and were so selected as to be of the same sex and strangers to each other. Their assigned task was in each case to work together for 15 minutes to construct a fiveminute radio script on "Why a course in social science should be required in all college curricula." Following the fifteen-minute interaction each was asked to estimate the other's evaluation of himself and of the other, and also to estimate his own performance.

The Twenty Statements Test asks each subject to answer the question, addressed to himself, "Who am I?" with twenty different statements. One of the derivatives of this test is the "locus score," which is the Guttman scale score which indicates, in general, the number and the pattern of consensual (unambiguous) statements made by the subject in identifying himself. In this research those with extremely low or high locus scores were more successful at role-taking than were those who made middle-range locus scores. Those making low locus scores showed greater willingness to accept as their own evaluation of themselves their estimates of the others' evaluations of them. Those who made a larger than average number of statements in identifying themselves were somewhat more successful in role-taking.

A score was computed from the number of non-consensual statements made in self-identification which proved to be associated with greater ability to perform role-taking of the second type (A's estimate of B's evaluation of B). Apparently A's ability to estimate B's evaluation of A, on the other hand, hinges on the clarity of A's view of his own relation to the social structure. A's ability to estimate B's self-evaluation appears to hinge on A's self-affect as indicated by emotionally-toned (hence non-consensual) statements made on the TST.

Success in role-taking also depended on the partner's self-views. When the partner had a high or a low locus score, the subject had a higher role-taking score of the

first sort (A's estimate of B's evaluation of A). The partner's total number of statements was also associated with this role-taking score.

Identification of self on the TST by reference to religion and family membership was found to be inversely correlated with role-taking, the former with the first type, the latter with the second type of role taking. "Intensity" of religious reference was found to be inversely associated with the subject's willingness to accept as his own his estimate of the other's evaluation of him. This was also true of the salience of family reference; i.e., the more salient the reference the lower the "acceptance score."

Identification of self as student, when saliently made on the TST, was positively associated with both role-taking scores and with acceptance score. Females did a more accurate job of role taking and made higher acceptance scores than did males.

When partners differed markedly in locus scores they had high role-taking abilities of both types. This association of difference in types of self-definition with role-taking ability was also true of number of non-consensual statements made and (though not statistically significant) of the total number of statements made.

We must conclude from this research that role-taking is not completely explainable in terms of the qualities of a given individual but depends in part on the interactive unit per se. In general the guiding proposition – that self-views are related to role-taking accuracy – was sustained by the findings of this research.

124 pages. \$2.00. Mic 57-1100

"AUTHORITY" AND "INGROUP" STANDARDS, AND CONFORMITY BEHAVIOR

(Publication No. 19,739)

Melvin Bruce Drucker, Ph.D. George Peabody College for Teachers, 1956

Major Professor: Nicholas Hobbs

Two groups of 74 and 121 subjects belonging to groups of higher and lower degrees of group cohesiveness, respectively, ranked nine responses for each Rorschach inkblot, and nine titles for each of ten Thematic Apperception Test pictures. All cards were projected onto a screen with an opaque projector. Five to seven days later, the subjects ranked the same material again. With the second administration, a fictitious norm was presented to each subject for each set of nine responses or titles. Each norm had a rank-order correlation of zero with the original ranking that subject had made for the card involved. Half the norms were labelled as rankings of "experts" in perception, half as "members of your group." Four of the TAT cards were blurred when they were projected to provide the less structured situation.

Three measures of authoritarianism were obtained: the F Scale, a measure of anti-intraception from a Sentence Completion Technique, and a combination of the standard scores from the F Scale and the SCT. A group cohesiveness scale was administered, as well as a biographical information sheet obtaining each subject's age, sex, educational level, and socio-economic status. A measure of adjustment was obtained from the original rankings for the Rorschach responses. The correlations of the authoritarian measures with the biographical information, group cohesiveness, and adjustment were calculated.

A correlational design was employed to test the following hypotheses:

1. The more authoritarian an individual, the more he will tend to adhere to "authority" and "ingroup" norms.

2. The more authoritarian an individual, the more he will tend to adhere to "authority" than to "ingroup" norms.

3. The more authoritarian an individual, the more he will tend to adhere to "authority" norms in less structured situations.

For the first hypothesis, out of 32 possible relationships, there were 24 significant relationships between the measures of authoritarianism and conformity behavior. Of these, seven were linear. Out of eight possible relationships, one supported the second hypothesis, and one the converse of the second hypothesis. None of 16 possible relationships supported the third hypothesis. The combined scores of the F Scale and the SCT were the best predictors of conformity behavior. All relationships between authoritarian measures and conformity measures were low enough to preclude predictability.

The reliabilities of the conformity measures ranged from .59 to .65. The higher and lower cohesive groups showed no significant differences between the means of any of the measures, except on the group cohesiveness scale. The F Scale showed significant, but low, correlations with age, education, adjustment, and group cohesiveness, and the SCT with group cohesiveness. The F Scale and SCT

correlated .07.

The conclusions drawn were:

1. The ranking techniques used in this study can be employed as measures of conformity behavior.

2. There appears to be a relationship between measured authoritarianism and measured conformity behavior which is probably nonlinear.

3. There appears to be no differential effect of

"authority" and "ingroup" norms on the conformity behavior of authoritarian individuals.

4. There appears to be no difference in the way authoritarian individuals respond to norms in more and less structured situations.

5. The data of this study support the authoritarian theory since relationships between authoritarianism and conformity behavior appeared. Any explanation of the relationship in terms of "authority" and "ingroup" norms and ambiguity of the situation is not possible.

6. Differences in group cohesiveness appear not to influence the relationship between authoritarianism and conformity behavior. 117 pages. \$2.00. Mic 57-1101

RESPONSE SEQUENCES IN AN ELEMENTARY SOCIAL SITUATION. THE INVESTIGATION OF A MAN-MACHINE SYSTEM.

(Publication no. 18,443)

Maynard Wolfe Shelly II, Ph.D. The University of Wisconsin, 1956

Supervisor: Associate Professor J. C. Gilchrist

A man-machine system was investigated in which the behavior of the machine was changed by the behavior of the man on the preceding trial. Because of this type of dependency, the experimental situation was considered to be an analogue of a simple social situation. On each of 400 trials the subject pulled one of four switches and either won or lost. The thirteen conditions consisted of three groups with their appropriate control groups: one in which repetition never led to a win for the subject; another in which repeating provided the best solution; and a third in which the probability of repeating winning was varied. The results showed: that only where the best strategy led to winning with a probability of greater than .5 were there very rapid changes from random play; that relative differences in the probabilities of leading to a win were the most important factor in leading to changes in responding; and that generally the subject played more randomly after a loss than after a win. Social behavior was briefly discussed as an extension of man-machine systems.

101 pages. \$2.00. Mic 57-1102

SOCIOLOGY

SOCIOLOGY, GENERAL

FRIENDSHIP AS A SITUATIONAL PHENOMENON: A STUDY OF FRIENDSHIP AMONG COLLEGE FRESHMEN

(Publication No. 19,638)

George Masterton, Ph.D. University of Pittsburgh, 1956

An analysis of studies published prior to the date of this study and of writings on literary views of friendship revealed that the results and conclusions of these writings were inconclusive and often contradictory. A different perspective seemed desirable. These writings, particularly their suggestions, offered bases for establishing hypotheses for the present study.

The purpose of this study was established, therefore, as being the application of a perspective, different from those previously used, to the friendship relationship with the expectation that further understanding of this relationship would be revealed. The perspective chosen was to see friendship as a situational phenomenon. L. J. Carr's concepts in his Situational Analysis were hypothesized as as being applicable to the friendship phenomenon.

Data were collected by interview, by questionnaire, and from the college records for a group of 55 female and 55 male freshmen living in two dorms at a small, denominational college. The questionnaires were administered twice, four months apart. Data obtained by the questionnaire included the following: (1) a classification of another freshman (of the same sex living in the same dorm) on a scale ranging from "disliked person" to "friend"; (2) ratings of that same person in terms of a list of personality characteristics and of a list of satisfactions; and (3) rankings of the characteristics on the list thought to be important and of the satisfactions on the list that were desired. The categories and the elements within the categories of characteristics and of satisfactions were obtained by use of a critical incident approach. This method suggested these categories as being the critical foci in the situational perspective. These categories were scored on an individual basis of weighting, using the top five characteristics and satisfactions as ranked by each individual. The various data were checked for association with the classifications on the friendship scale. The inverviews were analyzed for evidence that might give further understanding of the relationship.

It was found that associations between friendship classification and I.Q., M.A., and ratings on the Bell Adjustment Inventory were low. Propinquity within the dorm showed a moderate association, and degree of sharing of activities between friends showed a high association. The highest associations obtained in the study were between friendship classifications and rating scores for characteristics and for satisfactions. These ranged from .58 to .72. The interviews indicated the variety of elements involved in the development of friendship relationships and

suggested support for the major hypothesis, namely, friendship is a situational phenomenon.

From the various data findings and from interview analyses, the following conclusions were reached: (1) friendship existed to varying degrees; (2) friendship was not necessarily reciprocated; (3) friendship fluctuated with changes in situations; (4) factors such as I.Q., M.A., social and emotional adjustment, and propinquity helped to establish the situations within which more critical factors came into play; (5) these critical foci were occurrences revealing admired characteristics or offering desired satisfactions; (6) the particular characteristics admired and the particular satisfactions desired varied for individuals in their nature, number, and order of importance; and (7) friendship was a situational phenomenon.

151 pages. \$2.00. Mic 57-1103

THE DEVELOPMENT OF THE CORRECTIONAL, REFORMATORY, AND PENAL INSTITUTIONS OF MINNESOTA: A SOCIOLOGICAL INTERPRETATION

(Publication No. 18,947)

Orville Francis Quackenbush, Ph.D. University of Minnesota, 1956

Method: The historical method was used in the collection of the information necessary to present the story of the evolution of Minnesota's penal and correctional institutions. The data was gathered from the official documents of the state, the proceedings of national and state organizations interested in the fields of penology and correction, a selected number of state newspapers, and secondary sources which were relative and which covered the specific institutions under consideration or the broader aspects of the development of similar institutions in other states.

The first chapter introduces an examination of the concepts of crime and punishment. This includes a history of the changes which have taken place in the Anglo-American tradition in regard to the nature of crime and the criminal as well as the shift from capital and corporal punishment to the increased use of imprisonment as punishment for a majority of the crimes. In addition, the transformation of the rationale of punishment from retribution and retaliation to reformation and rehabilitation is examined and reviewed.

The body of the thesis is organized in the following manner: The history of each of the five institutions is presented separately and in the chronological order of their establishment, with the exception of probation and parole, which are presented in a separate chapter following the histories of the various institutions.

The history of the state prison is divided into four periods: the territorial period, 1849-1858; the early state

period, 1858-1889; the period between the establishment of the reformatory and the opening of the new prison, 1889-1912; and the period between 1912 and 1949. This was done for the convenience of handling such a vast amount of data.

The history of the reform school is divided into two periods: the period between the establishment of the school and the removal of the school to a new site, 1866-1895, and the period 1895 to 1949.

The reformatory, girls' school, and reformatory for women have been presented separately without breaking the histories into periods. In each case the data has been organized around specific fields of interest, such as the physical expansion, the administration, system of labor, comforts and benefits for the inmates, disciplinary methods, and the program of reform and rehabilitation of the institution.

The final chapter is devoted to a summary of the development of the state system and the conclusions regarding the factors which have been most instrumental in shaping it.

The analysis reveals that other factors than those immediately related to the planning of a penal system and program in line with the best contemporary opinion, play an important role in the shaping of the system as a whole. The system is an arm of the government, and therefore ultimately shaped by the representatives of the people of the state, at least in its broadest outlines, to conform to the will of the people and the factions that make up the society. The legislative leaders may be aware of the latest and most valid conclusions of the research in the field of crime and penology, but they are equally aware of the opinion of the public which elects them concerning criminals and the need of satisfying the demands of powerful factions, such as labor unions, religious bodies, judicial interests, taxpayers, and potential and actual criminals. 532 pages. \$6.75. Mic 57-1104

THE PARISHIONER AND HIS CHURCH: A STUDY IN THE SOCIOLOGY OF RELIGION

(Publication No. 20,063)

Benjamin Bernard Ringer, Ph.D. Columbia University, 1956

This study deals with the role of the Protestant Episcopal Church in the life of its parishioners and their response to its efforts to extend its responsibilities in secular society. It is based on data collected from a national sample of 1,530 Episcopalians.

The study is divided into two parts. Part I examines the parishioner's involvement in his church and its relationship to his secular commitments and roles. It reveals the absence of symmetry in the relationship between the church and the two sexes. Women are much more likely to be involved in the church than are men. These differences, however, arise only after both sexes reach independent adulthood and assume their distinctive roles in society: the woman, her family role; the man, his occupational role. So pronounced is this feminization of the church that only those men whose interests transcend their job and career, who share, in other words, some of the basic interests of the woman in the family and community show a marked tendency to relate themselves to the church.

The congruence between the family role of the woman and the church manifests itself after her children reach school age. Being capable of serving a broad spectrum of her interests, the church maintains its appeal even when the woman's interests shift in the course of the family cycle from family-centered concerns, such as socialization of the child, to woman-centered concerns, such as humanitarian and welfare activities.

The church also performs another family function. It provides those who are "unintegrated" in the family structure – persons who lack spouse and/or children – with the opportunity to gratify important psychological needs and to compensate for absent or incomplete family life.

The church also supports the status structure of secular society. It performs important status functions for some of its parishioners. Being an accessible elite institution, it serves as a significant vehicle for upward mobility for low status women. It enables them to satisfy their aspirations in a "better" surrounding than would be available to them in the secular community. It also provides "religious legitimation" for the secular power of high status men.

Part II deals with another secular-church relationship, that between church and political structure. It examines parishioner views on the question of political responsibility for the church.

Though the Episcopal Church has felt the need to assume such responsibilities, its parishioners are not fully in accord as to the propriety of a political role for the church. Primary opposition comes from those whose ties to the church are most intense rather than from those whose ties are most tenuous.

Only as a highly involved parishioner feels at home in political life does his resistance give way to active support. This indicates that church participation in political affairs is more compatible with certain secular values than it is with certain traditional church values. Political sophistication, the middle class ethos of civic responsibility, and political liberalism – all products of exposure to secular values and life – provide the church with its basic sources of support.

However, this support contains major reservations. One bears on the status attribute of the church. A parishioner requires that the church which engages in political activity be of the same class as he. Another reservation pertains to its "political ideology." A parishioner prefers that the church's political views be not too dissimilar from his. In other words, most parishioners, except for those highly involved in church life, see the question of church in political affairs from a secular frame of reference rather than from a religious one and accordingly place great emphasis on secularistic characteristics of the church – its status and ideology.

321 pages. \$4.15. Mic 57-1105

SOCIAL VALUES OF SELECTED ORGANIZATIONS

(Publication No. 20,027)

Miriam Alice Terry, Ph.D. Cornell University, 1956

Statement of the Problem: The purpose of the research was to study the relationship between standard beliefs,

attitudes and behavior preferences of a good organization member as conceptualized by leaders of specified organizations and the actual beliefs, attitudes and behavior preferences expressed by members of those organizations.

The Major Hypothesis was: Beliefs, attitudes and behavior preferences of organization members are positively related to the standard beliefs, attitudes and behavior preferences upheld by the organizations.

Five sub-hypotheses were set up for consideration:

- I. Individual members of an organization will be more similar to the normative standards of the organization (in beliefs, attitudes and behavior preferences) than will non-members.
- II. High participation in an organization is positively related to the participants conforming to organization standards.
- III. Strong conviction of the correctness and dependability of an organization's teachings is positively related to the member's conformity to the organizational norms.
- IV. The more the individual feels he is expected, by others, to conform the more he will actually conform to the standards of his organization.
- V. In some organizations the relationship between member values and group norms will be greater than in other organizations.

<u>Procedure</u>: Two units of analysis were used: 1. The organizational unit represented by norms obtained from the judgments of a selected group of active leaders in the organizations studied. 2. The member unit, made up of the individual members of the organizations.

Specific Steps in Procedure:

- 1. Identification of the social values was done by interviewing, and utilizing information from previous research.
- 2. Seven organizations with church, farm, civic or school interest were selected.
- Organizational standards were established on the basis of interviews with active leaders in the organizations.
- 4. The questionnaire was constructed with a view to measuring differences in value patterns by means of an instrument that could be left with the respondent for later pick-up.
- 5. The sample was selected randomly from among the members of the seven organizations in four New York State communities. The final sample consisted of nine-hundred-ten persons.

Results: Attitudes of the sample toward five standards of each of the organizations were studied. Comparisons were made between and within groups and distinct variations were found in beliefs attitudes and behavior preferences. Differences in proportions were tested for statistical significance using a formula which provided limits expected at the five percent level. Differences outside these limits could then be considered significant with 95% confidence.

Conclusions: The findings showed that the Major Hypothesis and all except one of the Sub-hypotheses were upheld in the data. In the one exception, Sub-hypotheses Two, in which a positive relationship was expected between high participation and high conformity the relationship was reversed. The data conclusively indicate that there is a relationship between the beliefs, attitudes and behavior patterns of a good organization member as conceptualized by leaders of special organizations and the actual beliefs, attitudes and behavior patterns expressed by members of those organizations.

163 pages. \$2.15. Mic 57-1106

A COMPARATIVE DEMOGRAPHIC ANALYSIS OF TWO LOUISIANA CITIES: BATON ROUGE AND SHREVEPORT

(Publication No. 17,456)

Ora Vesta Russell Watson, Ph.D. Louisiana State University, 1956

Supervisor: Professor Homer L. Hitt

The objective of this demographic analysis is to compare the populations of two Louisiana cities. Baton Rouge and Shreveport, with reference to number and distribution, race and nativity, age composition, the balance between the sexes, marital condition, educational status, occupational status, religious affiliation and population change. For the greater part the data utilized in the study were obtained from United States Government Census and Vital Statistics publications. When deemed reliable and useful, however, other sources of information were consulted.

Each of these urban centers is located on a river: Baton Rouge on the Mississippi River in south-central Louisiana and Shreveport on the Red River in the extreme northwestern part of the state. In 1950, Shreveport ranked as the second city in size in Louisiana, with 127,206 residents, and Baton Rouge was third with a population of 125,629. Whites constitute more than two-thirds of the population of both cities, with Shreveport's proportion of nonwhites slightly exceeding that of the Capital City. The nonwhites of both metropolitan centers consist almost entirely of Negroes, who live generally in definitely segregated areas, particularly in Shreveport. The foreign-born whites are of minor importance, constituting only a fraction of one per cent in each city.

The population of Baton Rouge is younger and more masculine than that of Shreveport, which is characterized by relatively higher proportions of females and aging persons. In both cities the greatest concentration of persons is in the productive ages, and sex ratios under 100 prevail. Among Baton Rouge inhabitants a higher ratio of males to females prevails than among the residents of Shreveport. In 1950 more than two-thirds of the adults in both cities were married, but this was the case for relatively more males in Shreveport and for more females in Baton Rouge.

The median school year completed and the proportion of persons having completed four or more years of college are higher in Baton Rouge, but relatively more persons within the school ages are in attendance at school in Shreveport. The educational status of the population of both of these cities is higher than that of any other

substantial component of Louisiana's population. In the two cities, as would be expected, whites have a higher educational attainment than nonwhites and females higher than males

The most important occupational category in both cities is that of "private wage and salary workers." Baton Rouge workers are primarily engaged in physical-production activities in blue-collar categories, while in Shreveport service-production activities of the white-collar variety predominate. The majority of church-affiliated persons are Protestant, with Baptists ranking first in importance. Catholics rank second numerically in Baton Rouge and third in Shreveport.

Indexes of fertility indicate that some of the recent rapid population increase in both cities is due to relatively high birth rates. However, in-migration seems to be by far the more important factor. Recent reports indicate that more than 50 per cent of the population of Baton Rouge has lived there less than 15 years, and similarly that the newcomers to Shreveport number over 300 families per month.

347 pages. \$4.45. Mic 57-1107

SOCIOLOGY, PUBLIC WELFARE

AN ANALYSIS OF THE INCIDENTS RELATED TO WATER FATALITIES OCCURRING IN THE UNITED STATES

(Publication No. 19,987)

Bramwell W. Gabrielsen, Ed.D. New York University, 1956

The Problem

The purpose of this study was to critically analyze the factors surrounding drowning fatalities occurring in the United States with the Objective of suggesting water safety procedures applicable to individuals, local communities, and appropriate state and federal agencies.

Each year approximately six thousand people lose their lives through some accident involving some form of aquatics. Most of the accidents are needless loss of life and could be avoided if the public were better informed as to the factors that are conducive to causing accidental drownings.

Historical Background

Much has been written in the field of aquatics dealing with safety, but the literature is devoid of any large scale research projects designed to gather desirable information about accidental drownings. Some cities and counties have conducted brief studies during the summer months, but in each case the facts gathered did not include all the information that people working in the field of water safety felt would be desirable.

Procedure

The investigator developed a reporting form for use by agencies reporting accidental drownings. Letters were

sent to each State Director of Vital Statistics asking them to cooperate in getting the informant in each case to secure the information called for on the reporting form. Twenty-two states indicated they would cooperate. As the reports were forwarded to the investigator, the information received was machine scored. Tables and diagrams were used to show the statistics on each factor studied. These data included both personal information on the individual and general information on facts surrounding the accident.

Results

At the end of 1955 the investigator had received 1,309 reports which represented people living in thirty-five different states. The information was analyzed by determining absolute and relative frequencies for each item called for on the reporting form. This was done for both the sample and the states of Michigan and Georgia so that some basis of comparison could be used. The findings were recorded in tables and diagrams were used to depict trends.

Some of the most important findings coming out of this study include facts such as: the large number of young children that drown; the larger number of people that drown who do not know how to swim and who have not had any swimming instruction; the fact that more people drown who are engaged in activities other than swimming; the fact that only 2.2 per cent of the cases studied occurred at areas patrolled by life guards; the large number of drownings that occur as a direct result of violation of good safety procedures for aquatics; and the fact that at many drowning scenes there was no one available at the moment who was trained in the skills of making a rescue or administering artificial respiration.

Conclusions

There continues to exist a need for employing better methods of reporting facts surrounding drowning fatalities to agencies concerned with recording deaths by accidental drowning.

Progress has been made in the reduction of the rate of drowning in this country during the past fifty years. But the problem of further reducing this rate will continue in the future and will require the united efforts of education, youth-serving agencies, municipal and state branches of the government charged with planning and supervising programs of aquatics.

As the population of this country increases and technology provides more leisure time and more interesting devices to use in aquatic activities, the problem of water safety will become more acute.

Recommendations

The findings of this study should be given the widest possible dissemination to the general public, to people in the fields of education and sociology, as well as to various local and state health departments.

194 pages. \$2.55. Mic 57-1108

AN EXPERIMENTAL INVESTIGATION OF METHODS OF MEASURING DICTION

(Publication No. 18,536)

Paul Heinberg, Ph.D. State University of Iowa, 1956

Chairman: Professor James F. Curtis

In an attempt to provide more knowledge of what diction or word usage is related to, how it may objectively be evaluated and how a speaker's diction may be improved a criterion consisting of the means of judges' ratings of diction as revealed by subjects speech samples were correlated with these subjects' scores on several types of verbal tests. The verbal tests used were two standard vocabulary type tests (Educational Testing Service's Verbal Knowledge Tests V-4 and V-5), two word fluency tests (Educational Testing Service's Word Fluency Tests W-1 and W-2) and three tests of synonym differentiation devised and refined for this experiment. The synonym differentiation tests involved items which required a testee to select the appropriate word from among three synonyms which best completed each statement or definition provided. The process of synonym differentiation was assumed to be related to diction (word usage) on the basis of the assumption that this process is one of recognizing the limits of the applicability of words to objects and events rather than, as in the usual vocabulary tests, one of recognizing the general locus or center of applicability of words. Ninety-one non-speech-defective, freshmen students at Oklahoma A. & M. College were used as experimental subjects. Each subject gave a three minute speech on the topic, "Why I Feel I Need A College Education." The first two minutes of each speech was recorded and transcribed with necessary punctuation provided. Nine speech faculty members and ten English faculty members of this institution rated each sample for the quality of diction (word usage) displayed. A nine point scale was used on which the extremes represented the best and worst of the samples judged. The correlation between speech and English judges was sufficiently high (.934) to justify using the means of the nineteen judges' ratings as the experiment's criterion. The two verbal tests which correlated highest with this criterion were Verbal Knowledge Test V-4 (.519) and Synonym Differentiation Test A (.518). The two tests combined produced a multiple correlation with the criterion of .553. The inclusion of additional tests failed to increase this correlation appreciably. Although these correlations are not sufficiently high to warrant an assumption that the factors of verbal knowledge and synonym differentiation are, when measured, measuring diction entirely, they are sufficiently high to indicate that increased skill in these abilities tends to produce better diction. Suggested revisions of items in Test A are provided for use of this test in the classroom and for future experimental investigation.

227 pages. \$2.95. Mic 57-1109

REALISM IN THE EARLY AND MIDDLE NINETEENTH CENTURY BRITISH THEATRE

(Publication No. 19,103)

Andrew John Kochman, Jr., Ph.D. The University of Wisconsin, 1956

Supervisor: Professor Ronald E. Mitchell

It is the purpose of this study to present a general description and analysis of theatrical production in the early and middle nineteenth century British Theatre in order to show the gradual development of the realistic style. Only those elements which affected the growth of realistic production are considered. Sources used include: theatrical criticisms, historical studies, biographies, autobiographies, and play scripts.

Three major divisions investigate: theatrical conditions in the early century to 1843, evidences of the realistic approach prior to 1843, and the realistic development

between 1843 and 1871.

The first division establishes the point of departure for the study by summarizing the traditions and conventions which were incompatible with a realistic approach to production. The general areas of study include: the star system, casting, rehearsals, theatrical conventions, the manager's province and the audience tastes and behavior.

Prior to 1843, the primary impetus to realism was scenery, based upon a pictorial approach to representation and a desire to be historically accurate. Gas and lime lighting were introduced with some experimentation in distribution and control. John P. Kemble and Charles William Macready realized the need for reform and within the limitations of their time effected some improvements in managerial practices. Progress was made in the following: elimination of prologues and epilogues, shorter programs, smaller theatres; and gagging, pointing, playing to the audience and breaking character were being recognized as abuses.

The abolition of the monopoly in 1843 encouraged realism because it brought the minor houses into open competition with the major theatres. Audiences were beginning to go to the theatre for escape and identification with the action and characters, and were less enthusiastic toward actors. The philosophies of the mid-century managers, Phelps, Charles Kean, Fechter, Boucicault, Bancroft and Robertson, defined their objective as making dramatic production a closer approximation of reality through authenticity and appropriateness in costume and scenery, ensemble acting, exhaustive research and study, realistic business, and contemporary plays. There was a gradual assumption of the director's responsibilities until Boucicault and Robertson became the first of the martinet directors. A new style of acting developed which was founded on these fundamentals: original interpretation based on close study of the script, motivation of character based on the actor's memory recall, unity of

characterization, ensemble acting, more conversational style of delivery, and restrained use of pantomime. The progress in authenticity and appropriateness in the technical elements of production continued during this period. Costuming and make-up, remaining within the actor's province, were lagging behind as were methods of illumination which awaited the development of electrical and control equipment. Play scripts were beginning to include stage directions which provided the basic design of the technical elements of production and also the basis for the visual and audible interpretation of the script.

The British Theatre between the years 1843 and 1871 witnessed a theatrical reformation which was stimulated by a growing dissatisfaction with the prevailing abuses and malpractices. With the disintegration of the traditions and conventions of the star system, there was the concomitant movement from the actor's theatre to the scenic artist's theatre and finally to the director's theatre. Throughout this period, there was a constant, conscious and conscientious striving for greater realism in production. Out of this development arose the fundamentals for a realistic theatre: unity of production, ensemble acting, a more colloquial style of acting, and documentation of play scripts to integrate the drama with the theatre in performance.

464 pages. \$5.90. Mic 57-1110

HORACE WALPOLE AS A CRITIC OF BRITISH PUBLIC ADDRESS

(Publication No. 19,851)

Jack Mills, Ph.D. University of Illinois, 1956

Since the effectiveness of a speaker in his own times is judged in great measure by the remarks of his contemporaries, it is important for the speech historian to know how much trust he can place in the remarks of the listener. One of the most quoted listeners in papers on eighteenth-century British oratory is Horace Walpole. Accordingly, the purpose of this study is to examine Walpole's criticism of speeches and speakers, to point out his categories of criticism, to examine his methods as a critic, and to assess the reliability of his criticism.

The principal sources used include the Toynbee edition of The Letters of Horace Walpole, Walpole's Memoirs of George III, Memoirs of George III, and The Last Journals.

Part I presents biographical details having a bearing upon Walpole's role as a critic. Part II presents his concepts of the nature and function of public address and his remarks about aspects of invention, delivery, style, arrangement, and memory. Part III presents an analysis of his role as a critic, wherein his methods are examined, the sources of his critical categories explained, his views of public address compared with those held by contemporary theorists, and his reliability as a critic tested. An index to the speakers mentioned by Walpole is presented in the Appendix.

Walpole's remarks on public address are based upon his experiences as a politician, as a political historian, as a letter writer, as a novelist and poet, as a literary critic, as a devotee of the fine arts, and on his observation of parliamentary oratory over a period of many years. Walpole viewed public speaking as a practical art and a fine art. He regarded it as a means of controlling the actions of an assembly, as an instrument for enhancing the reputation of the speaker, and as a source of aesthetic pleasure.

He was concerned with rhetorical invention to the extent that he singled out for comment certain of the logical, emotional, and ethical aspects of public speaking. He was interested in delivery in general, and particularly in the speaker's mode of delivery, his physical appearance, his bodily actions, and his use of the voice. His remarks upon oraforical style were directed mainly at matters of clearness, correctness, appropriateness, and impressiveness. He was seldom concerned with matters of arrangement and memory.

The method of evaluation Walpole most often employed was to record his dominant impression of the entire speech. His second method was to record his dominant impressions of one specific aspect of the speech. The third method was to analyze one specific aspect of the speech.

Walpole's way of viewing a speech was not the product of formal training in rhetoric, but the result of his having observed hundreds of speeches and applying his wide general knowledge of politics, history, literature, and the fine arts to the specific area of public speaking.

Although Walpole did not employ the language of the rhetorical theorist, his views indicate that he measured speaking by essentially the same standards of effectiveness as did the experts of his generation.

Although prejudice sometimes clouded his judgment, Walpole was generally a fair and impartial critic. His impressions of speakers are significantly similar to those held by other listeners. A comparison of his impressions of William Pitt, whom he disliked, with his impressions of General Conway, whom he liked, indicates that he made an honest attempt at impartiality in his criticism.

234 pages. \$3.05. Mic 57-1111

A STUDY OF THE ENGLISH SPEECH OF THE HUNGARIANS OF ALBANY, LIVINGSTON PARISH, LOUISIANA

(Publication No. 18,742)

Agnes Denman Nelson, Ph.D. Louisiana State University, 1956

Supervisor: Professor Claude M. Wise

The purpose of this study has been to analyze the phonetic and lexical features of the English speech of the Hungarians of Albany, Livingston Parish, Louisiana, in order (1) to determine whether there are, in their English speech, any deviations referable to the Hungarian language, and (2) to note other deviations from standard Southern English.

The medium of investigation has been the 1951 edition of The Work Sheets for the Linguistic Atlas of the U.S.A. and Canada and Associated Projects, compiled by Raven I. McDavid, Jr., and Virginia McDavid.

The writer selected six Hungarian informants whose English speech was representative of that of the community. These informants were interviewed and their responses were transcribed in workbooks in the symbols of the <u>International Phonetic Alphabet</u>.

In addition, a comparison was made of the sound-

systems of Hungarian and English speech.

From the responses of the informants, a tabulation was made of deviations from standard English speech. These deviations were analyzed and the sounds used were compared (1) to Hungarian speech-sounds, and (2) to the sounds heard in the speech of the surrounding area.

Summary of Conclusions:

The influence of Hungarian speech habits is apparent in the English speech of all informants, but is much stronger in the speech of the older informants, who learned English after they were of adult age. The chief Hungarian speech influences are the following:

- 1. The almost invariable substitution by all six informants of [t] and [d] for $[\theta]$ and $[\delta]$.
- 2. The pronunciation of [r], which was trilled by the two older informants, though pronounced as in General American speech by the other four informants.
- 3. Substitution of [i] for [1], $[\alpha]$ for $[\Lambda]$ and [v] for [w] by the two older informants. These two also usually added superfluous [g] or [k] to $[\eta]$.
- 4. The shifting of stress to the first syllable in words normally stressed on the second syllable.
- 5. The substitution of $[\tilde{\epsilon}r]$ finally for $[\vartheta]$ by informant Ib, and the use of $[\delta]$ for $[\vartheta]$ by all the other informants except Ia.

The influence of Southern speech on the English speech of the informants is less apparent than that of the Hungarian. The chief evidences of Southern influences are as follows:

- 1. The use of $[\[\[\[\] \]]$ for $[\[\[\[\] \]]$ and the occasional omission of intervocalic $[\[\[\] \]]$ by the oldest informant. The speech of no other informants showed this influence.
- 2. The dipthongization and nazalization of the vowel [æ], resulting in $[\widetilde{ae}^{I}]$ heard chiefly in the speech of informants Ia, IIa, and IIb.
- Frequent omission of [t] and [d] in the combination st and nd.

The English vocabulary of the Hungarians, though more limited, in general conforms to that of the other rural speakers of the locality. Syntactical deviations influenced by Hungarian are numerous in the speech of the two older informants.

226 pages. \$2.95. Mic 57-1112

AN ANALYSIS OF THE NIETZSCHEAN ELEMENTS IN THE PLAYS OF EUGENE O'NEILL

(Publication No. 18,945)

Esther Judith Olson, Ph.D. University of Minnesota, 1956

A number of critics have indicated the influence of Nietzsche's thought on several of Eugene O'Neill's dramas. In view of this fact, the present study was undertaken to determine, if possible, the extent to which Nietzschean elements can be detected in any or all of O'Neill's published plays. Such a study is dependent upon a knowledge of O'Neill's plays, as well as an understanding of the basic ideas and attitudes in Nietzsche's thought. For this reason, the study was divided into two parts.

The exposition of Nietzschean ideas and attitudes was presented in Part One of the study. The ideas and attitudes which were employed as a framework for the discussion of the plays in Part Two were: the view of tragic art, nihilism, the attitude toward Christianity, materialism, and women and marriage; and the three major concepts, the will to power, the Superman, and Eternal Recurrence.

Taken as a whole, the entire body of O'Neill's published plays might be considered an attempt to deal with "the sickness of today" which, like Nietzsche, O'Neill attributed to the death of the old God and the failure of Christianity, science, materialism, or any external agency to offer a satisfactory substitute.

In twenty-two of the thirty-two plays studied, there was noted either an implicit or explicit criticism of Christianity. In exposing Christianity, O'Neill, like Nietzsche, launched his attack on two fronts. He attacked the Church as an institution, and he castigated the effects of Christianity and its morality on the individual. In portraying the conflict between the affirmation of this life and the Christian negation of it in The Great God Brown, Strange Interlude, and Mourning Becomes Electra, O'Neill employed the same kind of language, imagery, and symbolic devices as Nietzsche had used in Thus Spake Zarathustra.

Second in importance to O'Neill's castigation of Christianity was O'Neill's attack against materialism. In fifteen of his plays, O'Neill has made either pointed attack or derogatory allusions to materialism as a false value. The author noted that O'Neill's treatment of materialism and the State as concomitants of Christianity, as well as his use of specific language and imagery, indicated a striking Nietzschean similarity which is not usual in plays which satirize or deride the emptiness of such a goal.

The study also revealed O'Neill's tendency to divide women into higher and lower types, an attitude which indicated a similarity to Nietzsche's ambivalent attitude toward women. It was found, too, that O'Neill, in his depiction of marriage, was more concerned with the Nietzschean ideal marriage than with the conflict of the opposite sexes.

There was evidence in the plays examined that the motivation of O'Neill's characters' behavior was not inconsistent with the Nietzschean doctrine of the will to power as the basic drive of human behavior.

The analyses of O'Neill's plays also revealed a division of humanity into the same general categories which were characteristic of Nietzsche's classification – the Dionysian Yea-sayer, the higher type, and the great mass of mankind, the all-too-many. Closely associated with the Superman

concept was Nietzsche's notion of Eternal Recurrence. This doctrine was enunciated in several of O'Neill's plays.

In addition to the above similarities, O'Neill's plays were revealed as divisible into two general periods which are predominantly affirmative or negative in their approach to the problem of life and death in the absence of the old God. Generally, the plays after Lazarus Laughed revealed an increasing preoccupation with death. In contrast to Nietzsche, who never lost his Dionysian faith, O'Neill seemed to succumb under the impact of Nietzsche's cry, "God is dead!" 637 pages. \$8.10. Mic 57-1113

AN INVESTIGATION OF THE RELATIONSHIP OF THE VOCAL AND COMMUNICATIVE ASPECTS OF SPEECH COMPETENCY WITH LISTENING COMPREHENSION

(Publication No. 20,004)

Joel Stark, Ph.D. New York University, 1956

During the past twenty-five years there has been increased realization that listening is a major language art, however, our knowledge about the skill is still somewhat limited. Although many popular speech text-books devote entire chapters to listening, there is a paucity of reliable evidence concerning the relationship between listening and speaking ability.

This study was concerned with the relationship between listening comprehension, and two aspects of speech competency: vocal ability (volume, pitch, quality, rate, stress, phrasing, and diction) and communicative ability (contents, organization, sentence structure, vocabulary, usage, and fluency).

One hundred and seventy five freshmen students at the City College, randomly selected, served as subjects.

Listening comprehension was measured by the Brown-Carlsen Listening Comprehension Test and speech competency was rated by panel of speech experts.

The obtained scores were converted into standard measurements and the three basic variables (listening, vocal ability, and communicative ability) were intercorrelated by computation of Pearson product-moment coefficients. These were converted to Fisher z' values and the standard errors were estimated. This enabled the experimenter to evaluate the reliability of the coefficients and the significance of differences between the correlations.

Since the factor of intelligence might have an indirect effect upon the correlations, this variable, based on the ACE examination, was held constant by computation of partial correlations.

The results revealed that the correlation between listening comprehension and vocal competency is .358± .06, and between listening and communicative competency is .595⁺ .02. The difference between the Fisher z' values is .31078⁺ .1068, and the investigator concluded that there is a positive correlation between listening comprehension and both aspects of speech competency, but a significantly greater correlation exists between listening and communicative competency than between listening and vocal com-

Intelligence was found to be substantially related to listening ability and communicative speech competency, and slightly related to vocal competency. It has an influence on the relationship between listening comprehension and speech competency. With intelligence held constant, there is a significant low positive correlation between listening and communicative competency, and a negligible relationship between listening and vocal speech competency.

The study has shown that competency in speech is related to listening ability. The development of good listening habits and increased emphasis on speaker-listener relationships should continue to remain a goal in speech 111 pages. \$2.00. Mic 57-1114 education.

ZOOLOGY

COMPARATIVE ACARICIDAL RESPONSES OF FIVE SPECIES OF SPIDER MITES

(Publication No. 18,726)

Mohammed Ramadan Abo-El-Ghar, Ph.D. Louisiana State University, 1956

Supervisor: Dr. L. D. Newsom

A laboratory study was conducted to compare the toxicity of two products containing sulphur and two containing phosphorus compounds to adults, nymphs and eggs of five species of spider mites attacking cotton in Louisiana.

An experiment was conducted also to investigate the response of spider mites to acaricides when reared on cotton and roses.

The five species were: Tetranychus tumidus Banks,

T. gloveri Banks, T. cinnabarinus Boisduval, T. lobosus Boudreaux, T. desertorum Banks.

The two products containing sulphur were aramite and sulphur; the two phosphorus compounds were parathion and Niagara Experimental Compound 1137.

Mites were reared in the laboratory on seedling cotton and treated in a dusting chamber.

Based on response to acaricides, species tested were grouped as follows:

- 1. Tetranychus tumidus Banks and Tetranychus
- gloveri Banks
 ~ 2. Tetranychus cinnabarinus Boisduval and Tetranychus lobosus Boudreaux
- 3. Tetranychus desertorum Banks

In general, T. desertorum was the most sensitive mite to parathion, but it was less sensitive to Niagara Experimental Compound 1137, aramite and sulphur; T. tumidus

was the most resistant mite to the acaricides tested. The three other species were intermediate in response. Susceptibility of mites tested varied with their developmental stages.

Parathion was highly effective against the five species, followed by Niagara Experimental Compound 1137, aramite and sulphur respectively. However, aramite and Niagara Experimental Compound 1137 showed the same toxicity in many cases.

Adults of <u>T. cinnabarinus</u> reared on roses were about 2 1/2 times more resistant to parathion than those reared on cotton.

94 pages. \$2.00. Mic 57-1115

STUDIES ON THE FRESHWATER PLANKTON OF PUERTO RICO

(Publication No. 17,842)

Gustavo Antonio Candelas Reyes, Ph.D. University of Minnesota, 1956

A study was made of the plankton and some of the environmental conditions of seven artificial reservoirs and one natural lake of Puerto Rico.

The plankton of one of the reservoirs, Lake Caonillas, was studied monthly from January 1952 to December 1952. The plankton from the other lakes was studied once or twice during the year and compared with that of Lake Caonillas.

Standard limnological equipment and procedure were used in this investigation.

The color of the water in the Puerto Rican lakes ranged from thirty to forty on the platinum-cobalt standard. The relative transparency of the waters was low, the Secchi disc disappearing at an average depth of 1.06 meters.

The maximum temperature recorded was 31°C and the minimum 22°C. No thermocline was found.

The hydrogen ion concentration ranged from pH 7.0 to pH 8.0.

The amount of dissolved oxygen ranged from 11.25 ppm to 0.2 ppm.

The carbon dioxide fluctuated from 2 ppm to 9.5 ppm. With the exception of only one lake no hydroxides were found.

The carbonates fluctuated from 0 to 64 ppm and the bicarbonate varied from 52 ppm to more than 200 ppm.

Thirty-one genera of algae were recorded from the lakes studied. The number of genera of algae in each of the various lakes ranged from eleven to sixteen genera. Forty-one species of zooplankters were found from these lakes. Rotifers were the most characteristic zooplankters of these Puerto Rican lakes.

The phytoplankton was characterized by an abundance of Bacillariae and Chlorophyceae during the cold dry season and by the Myxophyceae and Heterokontae during the hot wet season. The zooplankton was more abundant during the hot wet season.

The different plankton groups showed about the same vertical distribution in all the lakes studied. The Myxophyceae, Heterokontae and Chlorophyceae tended to decrease in numbers as the depth increased while the Bacillariae tended to increase in number with an increase in depth. All the zooplankton groups except the Rotifera

showed an increase in numbers with an increase in depth. It was observed that as the temperature and water level increased during the summer, the plankton increased in abundance.

No marked differences were found in the quality or quantity of the plankton from the natural lake and the artificial lakes.

The plankton of these tropical lakes differed from the plankton in the lakes of the temperate zone in the abundance of the plankton and in the predominant species. Some species of the zooplankton were the same as those reported from South America, but other species were the same as those common in the warmer lakes of North America.

138 pages. \$2.00. Mic 57-1116

BIOLOGICAL AND ECOLOGICAL STUDIES OF THE WHEAT CURL MITE, ACERIA TULIPAE (K.), ON WINTER WHEAT IN KANSAS

(Publication No. 20,359)

William Wallace Gibson, Ph.D. Kansas State College, 1957

Aceria tulipae (K.) is a vector of wheat streak mosaic, a virus disease of wheat occasionally causing multimillion dollar losses in Kansas. Because of a scarcity of information about this vector, a broad biological investigation was undertaken.

Studies were conducted in the greenhouse and in and around three field plots (A, B, C). One-sixth of each plot was sown with wheat at approximately two-week intervals from late July until October (1954) and November (1955), both drought years. Mite-infested wheat plants were added to the edge of the July planting at plots A and B, September 1, 1954. During two crop years, 5,869 wheat plants collected from the three plots were examined microscopically for mites.

Viruliferous and non-viruliferous mites from the sources of infestation spread through plots A and B with equal rapidity and intensity. The rates of spread and percentages of plants infested were similar at the naturally-infested plot C and the following year at plots A and B (C was discontinued). Additional mite sources apparently contributed little to the spread. As measured by the occurrences of mites and mosaic, the greatest initial spread of mites was for 30 feet or less.

Mite dispersal was greatly curtailed from October until March. However, death of annual grasses by freezing caused slight increases in the percentages of wheat plants infested during November.

Although generally known that early wheat planting encouraged high mosaic infection, this study correlated time of planting and mosaic infection in detail with time and severity of mite infestation. Each delay in successive plantings caused the percentage of mite-infested plants to decrease sharply, also reducing mite numbers by one to two generations. In late July plantings, colonies exceeding 1,000 mites appeared by fall. On these weakened plants, population pressures apparently stimulated migration, re-emphasizing the necessity for speedily destroying early volunteer.

Dense stands of wheat plants apparently contained more infested plants and more mites than thin stands, probably due to the greater chance of wind-borne mites landing on plants and the transfer of mites between touching leaves. Volunteer stands are often denser than planted wheat.

Detailed studies on stages of development of mites indicated that: (1) adults migrated more readily or successfully than nymphs, (2) oviposition continued all winter but moulting and egg hatching was retarded, and (3) reproduction was most rapid and prevalent on ripening heads.

A study of mite migration routes on wheat plants showed mites most frequently on terminal leaves. Thence, mites migrated into each new, rolled, terminal leaf before it fully emerged, thus being carried upward with plant growth. All mite stages, left behind, were exposed over winter on older, open leaves. From flag leaves, mites sometimes migrated down emerging beards, infesting heads while still in the boot. Mites left each ripening inflorescence part, migrating to parts still succulent. Mites left kernels in the hard dough stage causing the greatest, abruptly ending, dispersal of the year. Mites abandoned dying tissue but little local plant migration occurred; suggesting an exit by wind.

Aceria tulipae was the commonest sedentary arthropod found on wheat from November until June. Thrips, spider mites, and aphids commonly are associated with A. tulipae. In greenhouse experiments, aphids transported mites from infested to clean wheat plants.

Flowing, surface rain water appeared unimportant in mite dispersal.

Crabgrass, green foxtail, and 19 lesser species were found mite-infested for all or part of the summer. The inability of most of these grasses to harbor large colonies could be offset by the multitudinous numbers in which many of these grasses occur.

159 pages. \$2.10. Mic 57-1117

THE BIOLOGY AND BIODEMOGRAPHY OF ANOLIS CAROLINENSIS CAROLINENSIS VOIGT

(Publication No. 20,303)

Robert Edward Gordon, Ph.D. Tulane University, 1956

Chairman: Fred R. Cagle

The attributes of the abstract species or subspecies population are the sum of those of its concrete interbreeding units, the local populations. Information concerning the local population is thus vital to a knowledge of speciation.

Individuals of Anolis carolinensis carolinensis Voigt, the Carolina Anole or American Chameleon, inhabiting the west side of the Mississippi River in the vicinity of New Orleans, Louisiana, were considered collectively as comprising an abstract unit. A similar consideration was made for the east side inhabitants. Within each abstract population, a local population was investigated by quadrat, census, marking and observational methods. Data were gathered concerning the life history, including habitat selection, reproduction, mortality, movement, social behavior and growth. Seasonal variation in population structure

and density were studied. Supplementary data were secured from monthly samples from the populations and a laboratory colony of the lizards. The samples are preserved in the Tulane University Research Collections.

Significant differences between the abstract units were noted in 3 of 4 scale characters examined. Differences in population structure, density, movement and growth, as reflected by comparative study of the two local populations, were related to differences in vegetative and physical structure of the localities quadrated, rather than to genotypic diversity.

Rapid changes in age composition and residency, resulting in 100% turnover in a single annual cycle, occurred in both populations. Crude densities varied from zero to 109 and 176 individuals of all ages per 0.1 acre quadrat during the annual cycle.

Individuals were active at air temperatures of 60°F or more; cold torpor occurred at 55°F or less. Winter quiescence was intermittent from early November through mid-February. Aggressive behavior was lacking during the early winter period, facilitating the formation of hibernating aggregations. Movements near the hibernacula occurred on warm winter days. Maximal movements were recorded for trips to and from over-wintering sites.

Individuals 45 mm or more in snout-vent length were sexually mature. Reproductive activity occurred from April through August. Adult males displayed increased aggressiveness resulting in the acquisition of mutually exclusive ranges. Loose sexual bonds were formed between the male and female. A maximum of 4 females was observed on any one territory.

The female lays from 6 to 9 eggs per season. A single egg is laid at intervals of approximately 18 days. Each egg is apparently the result of a separate insemination. Evidence suggests that rain may stimulate nearsimultaneous egg laying by large numbers of females. The nest, if constructed, consists of a depression in surface debris made by the female prior to egg deposition. No parental care of the egg or hatchling is exercised after deposition.

The incubation period for 38 eggs under laboratory conditions was 29.8 days. Egg size during development and the size of the hatchling varies depending on environmental conditions during incubation. The snout-vent length of 28 hatchlings from eggs collected under field conditions, whose incubation was completed in the laboratory, varied from 19.4 to 24.4 mm, mean 22.4. Hatchlings were marked in the natural populations in July. Hatchling sex ratios did not deviate from an expected 1:1.

Growth of the hatchling was rapid. Males grew at a faster rate than females. The former may reach the sexually mature size in slightly more than 2 months. Both sexes attained the adult size prior to their second winter quiescence.

Mortality was associated with sudden temperature declines following periods of warmer winter weather. Predation and myiasis were also observed. Ecological longevity is not known, but evidence suggests that few individuals survive beyond 3 years. 274 pages. \$3.55. Mic 57-1118

A COMPARISON OF THE ACTIVITY AND MORPHOLOGY OF THE THYROID GLAND OF A HIBERNATOR AND A NON-HIBERNATOR WITH A STUDY OF THE MORPHOLOGICAL CHANGES IN THE PITUITARY GLAND OF THE HIBERNATOR

(Publication No. 19,411)

Roger Alan Hoffman, Ph.D. Purdue University, 1956

Major Professor: Dr. M. X. Zarrow

The importance of the thyroid gland in maintaining the normal metabolic rate and body temperature under adverse changes in ambient temperature is well known. Thus when a homeotherm is exposed to cold, an increase in the activity of the thyroid gland is apparent. In the hibernators however, exposure to cold during most of the year does not necessarily result in an increased metabolic rate but on the contrary results in a decrease, with entry into the hibernating state.

This study was undertaken therefore to investigate the question of how the thyroid gland of a hibernator (Citellus tridecemlineatus) differs from the white rat in morphology and physiology with season, cold exposure and stimulation with TSH. In addition the changes in morphology of the pituitary and other glands through the year were determined in the ground squirrel.

It was found that preparation for hibernation in ground squirrels is accompanied by an involution of the endocrine system. During hibernation however, these glands are stimulated to renewed growth and development to a maximum just prior to or during the breeding season.

Histological examination of the pituitary gland indicated that maximum activity occurs in February-March during the last stages of hibernation. Hibernation is possible at this time however, in spite of this activity. It is suggested that arousal of these animals from hibernation is under the control of some unknown mechanism which under proper stimulus causes a release of pituitary secretions.

In a comparative study of the changes occurring in the thyroid gland of ground squirrels and rats through the year, it was found that maximum cell height occurred in the spring (April-May) in the ground squirrel and in December for the rat. Minimum cell height occurred in late summer in the ground squirrel and remained at this low point until it began to increase during December-January. In the rat, minimum cell height was found in July and perhaps occurs before. Maximum storage of colloid occurred in October-November in the ground squirrel and in July in rats. Minimum amounts were found in April-May in the ground squirrel and in December in the rats. Production of colloid during the summer and early winter in the thyroid glands of ground squirrels appears to exceed the release. It is pointed out that both species show considerable fluctuation in cell height and percent colloid over the seasons. It is apparent however, that the changes through the seasons in each species are not synchronous in regard to time.

Investigation of the effect of cold $(2^0 \pm 2^0 C)$ on thyroid gland morphology of the two species showed that 5 days of cold exposure in the ground squirrel had no effect except during April-May when cell height was decreased significantly in both sexes and percent colloid was increased in the females.

In rats exposed to cold at 2, 5, and 15 days during July-August and December, a difference in sensitivity was found. In July-August when cell height was minimum in the normal animals and amount of colloid was at a maximum, colloid was released prior to discernible changes in cell height. In the winter period however, a cell height response was apparent sooner than colloid release. These results were taken to indicate that the thyroid gland of rats is more sensitive to cold during the winter. Comparing the two species, it is apparent that seasonal changes in thyroid gland sensitivity to cold take place in each species but the period of maximum sensitivity occurs in the respective periods of maximum cell height, i.e., December for the rat and April-May for the ground squirrel.

When L-thyroxine was administered to rats during the summer prior to cold exposure, cell height was decreased but percent colloid was changed little, if at all. Following a 2 day initial period, during which thyroxine continued to influence response, the cell height at 5 days increased at a greater rate of speed than was found in the normal coldexposed animals.

Following administration of TSH to thyroxine treated animals, maximum cell height response occurred at 2 hours in the ground squirrel and at 4 hours in the rat. Maximum cell height was produced with 5.0 units in the rat and 1.0 unit in the ground squirrel. The cell height response in the ground squirrel was not found to be significant due to large individual variation within groups.

Iodine uptake and release studies during May indicated that the thyroid gland of the ground squirrel was less active than that of the rat. Maximum uptake occurred at 48 hours in the rat and 24 hours in the ground squirrel. TSH administered simultaneously with radioactive iodine caused a marked increase in uptake in both species while thyroxine markedly inhibited uptake in both species. Five days of cold exposure prior to radioactive iodine injection reduced the time of maximum uptake in the rat to 24 hours but had no effect on uptake in the ground squirrel. Release of radioactive iodine however was inhibited in this species.

Considering the overall effect of cold and TSH on the thyroid glands of these two species, it appears that each shows seasonal changes. An adverse environment causes the necessary adaptive mechanisms to occur in each species, the type of adaptation depending on the necessary requirements of the species.

It was shown that even though cold stress does not cause a stimulation of thyroid gland activity in the ground squirrel, this gland is responsive to TSH. Thus in those seasons when cold has no effect, the pituitary gland is not stimulated to elaborate TSH and it is suggested that this could be due to a lack of responsiveness to cold on the part of the hypothalamo-hypophyseal system.

175 pages. \$2.30. Mic 57-1119

NOTES ON THE HELMINTHS OF MAMMALS IN THE MOUNTAIN LAKE REGION

(Publication No. 17,612)

Harry Lee Holloway, Jr., Ph.D. University of Virginia, 1956

The examination of one hundred and seventy-eight mammals of six orders and twenty-two or twenty-three species has thus far revealed the presence of twenty-six species of helminths. The reports are all new locality records.

Centrorhynchus wardae sp. nov. from Spilogale putorius is described and figured. S. putorius is considered an accidental host, and the analysis of the gastric contents revealed that the "skunk" probably became infected upon ingesting Ambystoma species. The species is compared to the known species of this genus from North American hosts and a key to the species is given.

A previously unrecognized species of the genus Centrorhynchus from Procyon lotor lotor is described and figured in detail. It is compared with another unnamed species of this genus from Natrix sipedon.

Macracanthorhynchus ingen from Procyon lotor lotor is refigured and described. Its apparent discontinous distribution is considered.

Moniliformis clarki recovered from Tamias striatus is described and figured. The ecological situation in which the host was recovered does not appear to corroborate Chandler's (1947) correlation between the incidence of Moniliformis in grey squirrels and the habitat of the host.

Echinopardalis macrurae is described and figured. This is the first report of this species in an endemic situation in North America. The host, Spilogale putorius, is considered to be accidental and the biology of the specimens recovered is discussed. Unsuccessful attempts to infect white laboratory rats with this species by feeding them coprophagous insects are considered.

Data on hosts and geographical distribution of Neo-echinorhynchus cylindratus are summarized from the literature. The morphology of the species is considered and figured in detail. Maturity data on N. cylindratus from Westhampton Lake appear to indicate that Micropterus salmoides, in this particular locality and during the course of this study, is the only species of fish in which this parasite is capable of attaining bisexual maturity.

Twenty-eight species of fish, one fish-eating mammal, and one ostracod are recorded as hosts for N. cylindratus. N. cylindratus has been reported most frequently from Micropterus salmoides (9) and Micropterus dolomieu (5). The mammal is regarded as an accidental host. Developmental stages occur in the ostracod. The fish listed include both normal and accidental hosts.

N. cylindratus is recorded from nine states (eight east of the Mississippi River and Minnesota) and the Canadian province of Ontario. The lack of records of this parasite in states west of the Mississippi may be due to lack of field studies. Suitable definitive hosts and probably intermediate hosts are much more widely distributed than the known distribution of N. cylindratus. Factors responsible for the restricted distribution of this parasite cannot be revolved at this time.

Cysticerci of <u>Hydatigera</u> (<u>Taenia</u>) <u>lyncis</u> are reported for the first time from the wood rat (<u>Neotoma</u> magister).

Wood rats in the Mountain Lake region show a 37.5% incidence of infection with this larval tapeworm. The morphology of the cysticercus is described and figured in detail.

The domestic cat, Felis domestica, has been demonstrated to be a suitable experimental definitive host for Taenia lyncis. The data on experimental feedings are given and discussed.

The data concerned with the unsuccessful attempts to cause white laboratory rats to act as the intermediate host are given. The author considers the failure to infect these rats to be due to the intact cuticle surrounding the fed proglottids or the natural resistance of the experimental rats (Holtzman Strain, V. P. I.). The attempt to infect laboratory rats (Holtzman Strain, V. P. I.) by feeding them bobcat feces was unsuccessful probably because of the absence of viable eggs or the natural resistance of the experimental hosts.

The similar results obtained upon attempting to infect white rats from the Wildheim Game Farm by feeding them dung of the infected cat may indicate that the white rat is not a suitable intermediate host.

The morphology of the specimen of <u>Taenia</u> <u>lyncis</u> recovered is considered and refigured in <u>detail</u>, and compared with the original specific description.

The natural and experimental hosts of <u>Taenia lyncis</u> are: <u>Lynx rufus rufus</u>, <u>L. r. californicus</u>, <u>L. r. fasciatus</u>, <u>L. r. uinta</u>, <u>Felis concolor azteca</u>, <u>F. c. hippolestes</u>, <u>F. c. oregonesis and Felis domestica</u>.

The vertebrate intermediate host in the Mountain Lake region is Neotoma magister. Larvae inquirenta occur in:

Odocoileus columbianus scaphiatus, O. hemionus hemionus,
O. virginianus macrourus and Peromycus maniculatus nubriterrae.

The life cycle of this species as it occurs in the Mountain Lake region is given, discussed and figured.

158 pages. \$2.10. Mic 57-1120

THE PRODUCTION OF MUTATIONS BY CHEMICAL TREATMENTS OF THE POLAR CAP OF DROSOPHILA MELANOGASTER

(Publication No. 19,463)

Shanta Venkatesa Iyengar, Ph.D. Indiana University, 1956

The possibility of using the embryonic stage of Drosophila melanogaster, designated the polar cap stage, has been investigated. The polar cap stage is reached about 2 hours and 15 minutes after fertilization and lasts about 70 minutes. The germ cell progenitors – the pole cells – are here disposed posteriorly in the form of a transparent disc easily accessible to action by chemicals being cut off from the exterior merely by the vitelline membrane. As a "pilot" chemical, nitrogen mustard, was used while formaldehyde, methylcholanthrene and potassium permanganate were the test chemicals.

Formaldehyde has been known to be mutagenic only in the males; methylcholanthrene is a potent carcinogen and according to the somatic mutation theory of cancer it would be expected to be also mutagenic to the germ cells; potassium permanganate, a strong oxidising agent, was used to confirm or disprove its earlier doubtful mutagenic potentiality, and since oxygen affects chromosome breaks and peroxides induce mutations it would stand to reason to expect it to be mutagenic. Lethals were scored on the IInd chromosome by Muller's methods.

Two methods were used to treat eggs in the polar cap stage. (1) The bath method where eggs are immersed in the chemical en masse for a required period and (2) the local method of treating only the polar cap by a special apparatus. The bath method proved effective for nitrogen mustard - a well established mutagen - and potassium permanganate, while both formaldehyde and methylcholanthrene gave negative results. By the localized method, however, potassium permanganate showed a highly positive result, methylcholanthrene a definite but not drastic rise in the lethal mutation rate and formaldehyde showed suggestive results. However, formaldehyde produced visible mutations and a few sub-lethals. It seems therefore that all these chemicals are mutagenic to varying degrees. The number of sub-lethals among potassium permanganate and methylcholanthrene treated flies speaks for their "non-specific" effect. From the results obtained formaldehyde appears to affect the female but the number of tested chromosomes is not sufficiently large to be definite about this fact but it is highly suggestive that the chemical perhaps acts similarly on both the sexes of this stage of Drosophila melanogaster. 63 pages. \$2.00. Mic 57-1121

THE COMPARATIVE VALUE OF DIFFERENT POLLENS IN THE NUTRITION OF OSMIA LIGNARIA SAY (HYMENOPTERA-APOIDEA)

(Publication No. 18,940)

Marshall David Levin, Ph.D. University of Minnesota, 1956

A technique is described for collecting completed nests of two species of Osmia. The eggs were removed from completed nests and transferred to small vials containing the experimental diets to be tested. The Osmia bees were then reared on these diets under laboratory conditions.

The nests of O. lignaria were collected from locations where waterleaf (Hydrophyllum capitatum Doug.) was the dominant plant. The natural pollen balls fashioned by the Osmia bees were composed entirely of pollen from waterleaf and these natural pollen balls served as the control diet.

A number of other species of pollen, gathered by honey bees and separated from pollen trap collections, were used as experimental diets in addition to several formulations of artificial diets. Pollens other than the natural diet, waterleaf, which allowed complete development to the adult stage were pea (Pisum sativum), alfalfa (Medicago sativa), mustard (Brassica nigra), and a mixture of these and other pollens. Pollens which did not allow complete development were gumweed (Grindelia squarrosa), greasewood (Sarcobatus vermiculatus), povertyweed (Iva axillaris), and dandelion (Taraxacum officinalis). None of the artificial diets permitted any significant growth.

Among the honey bee-collected pollens that permitted complete development only pea pollen came close to the natural diet in nutritive value, as indicated by the maximum

size of the larvae (about 190 milligrams) and the duration of the feeding period (10 to 15 days). Larvae feeding on mustard and alfalfa pollens developed slower and reached a lower peak weight.

There was an indication that waterleaf and alfalfa pollen one year old had less nutritive value than fresher pollen of the same two species.

Some of the pollens which did not allow complete development were supplemented with several materials in an attempt to increase their nutritive value. Gumweed pollen was not improved significantly by the separate addition of vitamin-free casein, yeast, or cholesterol. Greasewood pollen was improved by the addition of casein but only when dried yeast was added to casein-supplemented greasewood pollen were the larvae able to complete their development. A further increase in nutritive value was shown when dried egg yolk was added to greasewood pollen supplemented with casein and yeast. These improvements indicate the probable deficiency in greasewood pollen of some or all of the B vitamins and of cholesterol. They also show that larvae of O. lignaria require these dietary factors.

The use of Osmia larvae as a bioassay test insect is discussed. The technique appears to be useful for studying the comparative nutritive value of pure pollens, resolving the nutritional requirements of Osmia bees, studying the relationship between larval food requirements and adult host plant range and comparing the nutritional needs of Osmia bees and honey bees.

90 pages. \$2.00. Mic 57-1122

A STUDY OF THE TOXICITY OF NORMAL RABBIT SERUM AND ANTISERUM ON THE 72 HOUR CHICK EMBRYO, IN OVO

(Publication No. 19,471)

Alton M. Mun, Ph.D. Indiana University, 1956

The specific objectives of the present investigation were at first twofold: (1) to determine the antigenicity of the early chick embryo, and (2) to study the effects of antisera on the early chick embryo. However, since the striking toxic action of fresh normal rabbit serum was encountered, it became of interest to better characterize the cytotoxic factor(s) by serological means.

The effects of normal rabbit serum and antiserum on the 72 hour chick embryo were studied by first cutting a square window in the shell of the egg and then dropping the serum through a small hole which was made in the vitelline membrane near the embryo. The window was sealed with Scotch tape, and the embryo was examined 18 to 20 hours later.

The cytotoxic action of normal rabbit serum, characterized by the puckering of the blastoderm, the sinking of the embryo under the pursed blastoderm, and its final death, was removed by heating at 56°C for 30 minutes. The toxic effect was not removed by absorptions in the cold with chicken red blood cells, or with non-specific precipitates. The toxic action of heated normal rabbit serum was not restored by the addition of fresh guinea pig serum. These results are interpreted as indicating that

complement was neither necessary nor sufficient to elicit the toxic action of normal rabbit serum. Substances which were absorbed with chicken red blood cells were also not necessary for the toxic action.

The antigenicity of the 72 hour chick embryo was demonstrated by its ability to elicit the production of precipitable antibodies in the rabbit. Heated rabbit antiserum against the 72 hour chick embryo evoked a weak but definite toxic response when placed on the homologous embryo. The activity of the antiserum was apparently decreased by the heating of the serum. Therefore, in an attempt to decrease the probability of the appearance of false negative reactions, methods were sought to increase the response of the embryo to the antisera. Substances which could have been inactivated by the heating were returned to the antiserum singly and in combination. The toxic action of the heated rabbit antiserum was partially enhanced by the addition of fresh guinea pig serum which was rich in complement. The toxic action of the heated rabbit antiserum was not increased by the addition of fresh rat serum which was shown to contain a large amount of properdin, a heat-labile serum constituent. The toxic action of heated rabbit antiserum was greatly enhanced by the addition of both guinea pig serum and rat serum.

The results summarized above suggest the possible involvement of properdin or properdin-like substances together with the interaction of the different components of complement in the action of the antiserum on the early chick embryo.

These studies provide the necessary background for further studies of more specific and perhaps weaker antisera on the chick embryo. 67 pages. \$2.00. Mic 57-1123

EMBRYOLOGICAL STUDIES OF CERTAIN TELEOST FISHES WITH SPECIAL REFERENCE TO THE POSSIBLE SIGNIFICANCE OF MELANOPHORES IN PISCINE TAXONOMY

(Publication No. 18,741)

Saw Tha Myint, Ph.D. Louisiana State University, 1956

Supervisor: Professor Ellinor H. Behre

The present work is an embryological study of certain egglaying freshwater teleost fishes, with special reference to the significance of developing melanophores in piscine taxonomy. Nine species of tropical fishes, representing four families and three orders, all well known to aquarists, were reared in the laboratory. These include, according to Schultz (1955), Hyphessobrycon serpae (Characidae); Brachydanio rerio, Brachydanio albolineatus, Brachydanio nigrofasciatus and Tanichthys albonubes (Cyprinidae); Oryzias latipes (Cyprinodontidae); Betta splendens, Trichogaster trichopterus and Colisa lalia (Anabantidae). Observation of developmental stages, drawings and charts are included.

The eggs and early stages of embryogenesis are presented. For the study of melanophores four arbitrary stages were selected – initial, primary, transitional, and final stages of embryonic pigmentation. These stages are

not static but merge one into the other in varying degree of rapidity. For regional comparison certain key areas on the embryonic and larval body were selected. Generalizations in each case rest on four batches of at least ten eggs each. Basing stages on a time factor is not reliable, as wide variations occur due to such environmental conditions as temperature, oxygen content of water, and fungus growth on eggs.

In one family, Anabantidae, a greater similarity exists between eggs of two genera than between eggs of each of these and eggs of the remaining genus. But since egg characters may well be considered adaptive, it would not seem necessarily implied that these similarities support interpretation of relationship.

It is observed that melanophore formation is similar in the species of a given genus. The genera of a family present a different situation. In the cyprinids the two genera, though identical in the initial site of pigmentation (eye), differ from one another in other stages. This initial site (eye) of pigmentation is gound in Oryzias latipes (Cyprinodontidae); this suggests a probable relationship between the families Cyprinidae and Cyprinodontidae. In other stages of pigmentation the members of the two families differ.

The three genera of the family Anabantidae on the other hand are unique in having the yolk as the initial site and also in the possession at the initial stage of pigmentation of a comparatively large number of melanophores, suggesting a family character. Similarities in the succeeding stages are greater between Trichogaster trichopterus and Colisa lalia than between either one of them and Betta splendens.

Hyphessobrycon serpae of the family Characidae does not resemble any other species at any stage of pigmentation. The majority of the recognized authorities of piscine taxonomy keep families Characidae and Cyprinidae in a single order. The family Characidae, is placed however, under a separate order from that of Cyprinidae by Jordan (1923); and the present data at least suggest the correctness of this interpretation.

The overall consideration of the stages of pigment formation in these fishes indicates taxonomic relationship, the indication being strongest in the final stage of pigmentation. In this stage related species resemble each other but may be separated finally by melanophore counts on key areas, by general distribution and by pattern formation.

102 pages. \$2.00. Mic 57-1124

NEW TECHNIQUES, USING DYES, FOR STUDYING THE MOVEMENTS OF SMALL MAMMALS

(Publication No. 20,421)

John Gabriel New, Ph.D. Cornell University, 1956

Laboratory screening of over 100 dyes (90 per cent water-soluble) administered orally to white mice and rats, culminated in the selection of 46 dyes that appeared satisfactory for studying the movements of small mammals.

A 50-foot grid was established in a field and in a woodlot. Half of a wax-coated quart milk container was baited with rolled oats and placed at each station. The boxes served to protect the bait and as receptacles for feces. Visitation, as evidenced by deposition of scats (feces), was recorded by species. The introduction of dyed bait at certain stations enabled the author to record distances moved from the station with dyed bait, when colored scats were recovered at various stations in the grid. From a frequency distribution of distances moved, it was demonstrated that the short-tailed shrew, Blarina brevicauda talpoides, ranged shorter distances in the woodlot than in the field. A "t" test for 13 days on which data were collected similarly was highly significant for both distances moved and number of stations visited. Data accumulated by live-trapping and then releasing Blarina, after feeding them dyed bait in the trap, revealed the same trends. One shrew visited 8 stations (1.5 acres) during 24 hours. Similar studies with <u>Microtus</u> <u>pennsylvanicus</u> and <u>Peromyscus</u> <u>leucopus</u> were conducted. <u>Deermice</u> ranged greater distances than either shrews or meadow mice and only 8 per cent of the dyed scats for this animal were recovered at the dyed-bait station. The same figures for the other species are: Microtus, 22; Blarina, field - 26, woods - 50. Areal and linear estimates based on modified averages of distances moved, compare favorably with home range data from the literature. The water-soluble dyes found suitable for field use are indicated below. After the name of the dye, the following information appears: Color index number if present, color of the dye in feces, and the initial of the genus with which the dye was found acceptable. Certified dyes were used wherever possible. Microtus was not exposed to wool violet 4BN. Dyes listed as not suitable for Microtus or Peromyscus warrant further investigation. Acceptable dyes were: Rosanilin hydrochloride - 676, red, B, M, P; Orange I - 150, orange, B; Fluorescein (spirit-soluble) - 766, yellow-green, B; Fast green FCF - blue-green, B, M, P; Niagara sky blue 6B - 518, blue, B; and Wool violet 4BN - 697, violet, B, P. Other dyes are recommended as substitutes or for further testing. Several dyes were found useful for their fluorescent properties.

Dyes were placed at all stations in a single line bordering an area that was being snap-trapped, to determine ingress from the untrapped area. Results were incomplete but the practicality of the technique was adequately demonstrated

All stations in the field and woods were baited with dyes and snap-trapped within 12-24 hours. Individual Peromyscus were recovered marked with 4 dyes, indicating a minimum distance moved of 250 feet. Deermice were marked with more dyes and retained them longer than shrews or meadow mice because of their less fossorial habits, slower metabolism, and long tails which picked up and retained the dyes. The percentages of marked, snap-trapped animals were as follows: Blarina – field (1955), 45.9; woods (1955), 55.2; woods (1956), 44.9; Microtus – field (1955), 51.9; Peromyscus – woods (1955), 83.3; woods (1956), 100.

Certain dyes were found more permanent. Alizarin coated the teeth of Microtus and Peromyscus and was recovered from some deermice 9 days after dyed-bait removal. Sudan III stained fat a vivid salmon-orange, and was recovered in Peromyscus 3 days, and in Blarina 10 days, after bait removal.

The potentialities of these dye techniques are discussed and certain suggestions for future applications and improvements are made. 146 pages. \$2.00. Mic 56-1125

HOUR-TO-HOUR VARIATION IN THE VOLUME OF NOCTURNAL MIGRATION IN AUTUMN

(Publication No. 18,743)

Robert James Newman, Ph.D. Louisiana State University, 1956

Supervisor: Professor George H. Lowery, Jr.

Observers at 87 locations in North America have made 239 telescopic counts seven hours or more in duration of southbound migrants passing before the moon. When the numbers of birds seen each hour are adjusted for theoretic variations in the amount of observation space, their means follow a pattern of change very similar to that of spring. The computed volume of migration increases from dusk to the 10 p.m. hour and steadily declines thereafter.

When these data are variously subdivided into component groupings, the general ascending-descending shape of the hour-to-hour patterns remains unaltered. Only the slope of the curves and the earliness or lateness of the distributions, as evidenced by mode and median, vary. From September to November, as twilight comes earlier and earlier, the median shifts approximately 40 minutes toward the early end of the time scale. Within each lunation, a night-to-night progression of the median takes place in the opposite direction, apparently in correlation with the changing time when the moon reaches the peak of its orbit. The pattern also varies somewhat with the total amount of migration taking place. Low-volume migration produces proportionately higher adjusted counts at the beginning of the night, and proportionately lower adjusted counts in the middle of the night, than migration in great volume. Flights in the wrong direction exhibit the typical hour-to-hour pattern in the latter half of the night, though their variation before midnight is erratic.

The effects of low-volume migration and the time of twilight are reflected in the distributions for regional groupings such as the North, the South, and the Far West. The sharply peaked northern pattern, showing maximum migration in the 11 p.m. hour, bears closer resemblance to the continental spring pattern than to the autumnal pattern for the South. The later northern twilight probably accounts for this peculiarity. The pattern for the Far West, where heavy nocturnal migrations seldom occur, is characterized by a reduced contrast between maximum and minimum adjusted counts - an expected feature of lowvolume migration. Local distributions are more aberrant than any of the regional patterns. Autumnal curves for Baton Rouge, La., and Memphis, Tenn., have extremely early peaks. At Little Rock, Ark., the migration is well sustained until late in the dark period.

When the fall counts are adjusted for lost time only, their means behave differently. The number of birds remains approximately the same for two or three hours following twilight and during the remainder of the night steadily diminishes. Time-adjusted spring counts on the other hand, exhibit an ascending-descending pattern, though not in such well developed form as their space-adjusted counterparts.

Data from Baton Rouge covering four 15-night periods of successive observation support the idea that the computed migration densities are affected by the position of the moon. But current analyses indicate that Baton Rouge counts may be seriously contaminated by bats and insects. During the September-October lunation of 1955 at this

station, flight calls of migrants were also recorded. The hour-to-hour variation in the number of flight calls was the inverse of the visual pattern.

The correlation between computed migration and the altitude of the moon suggests that certain features of the hour-to-hour patterns may be artifactual, that they are induced by over-correction for theoretical changes in the size of the observation space. The suspicion that these patterns may not tell us all there is to known about the variation in the volume of migration in the sky is strengthened by the fact that birds are heard overhead when none can be seen. Further analysis of the data at present available should do much to resolve these uncertainties.

202 pages. \$2.65. Mic 57-1126

RODENT POPULATION DYNAMICS IN UNCULTIVATED FIELDS OF LOUISIANA

(Publication No. 18,745)

Herbert Edwin Shadowen, Ph.D. Louisiana State University, 1956

Supervisor: Professor George H. Lowery, Jr.

This study was undertaken in an effort to accumulate information concerning small-mammal populations, home ranges, territories, and life histories. Live traps, constructed of 1/4 inch mesh wire, were placed at marked intervals in two uncultivated fields near Baton Rouge, Louisiana. The quadrats were 1.67 acres and 2.98 acres in size, and 100 traps, placed in rows of ten, were used on each plot. The trapping periods varied from two to 16 days. The trapped rodents were weighed to the nearest tenth of a gram. They were marked for later recognition by punching holes in their ears according to an established numbering system. Bait consisted of peanut butter and rolled oats. The field work was begun in November, 1954, and terminated in November, 1955.

The following species were trapped more than once and are listed in descending order according to number of captures: Sigmodon hispidus, Reithrodontomys fulvescens, Reithrodontomys humulis, Cryptotis parva, Oryzomys palustris, and Mus musculus. Over 75 per cent of the total captures consisted of the first two species named.

Sigmodon hispidus and Cryptotis parva were active both day and night. Reithrodontomys fulvescens and Reithrodontomys humulis were seldom trapped during the day. Some Sigmodon hispidus births occurred throughout the year, but most reproduction of this species took place from April to September with the peak in late spring. The sex ratio was essentially equal. The number of male Reithrodontomys fulvescens was considerably higher than the number of females.

The average weight of Sigmodon hispidus was 79.1 grams with a range of 11 to 223 grams. The adult average weight was 106.8 grams. The average weight of Reithrodontomys fulvescens was 9.6 grams with extremes of 4.0 and 14.5 grams. All weight averages were based on the initial capture of each animal.

The highest recorded populations for the entire study, based on all initial small-mammal captures, were 54.05 mammals per acre on the Kleinpeter plot and 22.78

mammals per acre on the University plot. The peak recorded Sigmodon hispidus density was 22.97 rats per acre in November, 1954, at the beginning of the study. On both plots the low point in population size occurred in late summer and early fall. The peak densities of Reithrodontomys fulvescens and Reithrodontomys humulis were 18.92 mice per acre and 8.11 mice per acre respectively.

The minimum home range and the major axis of the home range were determined for all Sigmodon hispidus and Reithrodontomys fulvescens trapped three or more times. The results were as follows with the minimum home range average listed first followed by the average major axis of the home range: male Sigmodon hispidus — 4924.2 square feet, 137.3 feet; female Sigmodon hispidus — 4798.9 square feet, 145.8 feet; male Reithrodontomys fulvescens — 12,383.9 square feet, 221.4 feet; female Reithrodontomys fulvescens — 13,065.4 square feet, and 210.5 feet. The size of the home range was larger in winter than in summer.

The points of capture of each animal were marked on charts, and the charts were superimposed upon each other in an effort to determine the extent of territoriality. There was little evidence of territoriality at any time of the year by either Sigmodon hispidus or Reithrodontomys fulvescens.

98 pages. \$2.00. Mic 57-1127

THE RELATION OF THE STRUCTURE OF A SERIES OF CHOLINESTERASE INHIBITING INSECTICIDES TO SYNERGISM AND ANTAGONISM WITH PIPERONYL BUTOXIDE ON THE HOUSEFLY, MUSCA DOMESTICA (L.)

(Publication No. 20,364)

George Whitaker Ware, Jr., Ph.D. Kansas State College, 1957

The pyrethrum synergists, piperonyl butoxide, piperonyl cyclonene, sesamin, MGK-264 and n-propyl isome, have been investigated extensively with the botanical insecticides, the chlorinated organics, and some with the organic phosphorus compounds. These synergists have been found to increase the activity of a portion of each group. Hoffman et al. (1954) noted, however, that some of the synergists were antagonistic with malathion. Rai et al. (1956) confirmed this work using piperonyl butoxide and malathion on houseflies.

Two studies were conducted in this work to determine (1) the effects of the chemical structure of malathion and several of its analogs and their interaction with P.B., and (2) the penetration of P.B. when it is an antagonist or a synergist for phosphorus compounds.

The insects used in all tests were four-day-old males of a susceptible strain of houseflies. The flies were sexed on the third day and held at the test temperature of $74 \pm 2^{\circ}$ F., in a constant temperature chamber for approximately 24 hours. Pint mason jars with a cheese cloth covering, containing a portion cup of cellucotton and dilute canned milk were used as holding containers. The insecticide dilutions were made with glass distilled acetone and applied to the mesosternum of the fly with a microapplicator and tuberculin syringe. A steady flow of CO_2 served as the anesthetic.

ZOOLOGY

The effects of chemical structure of the toxicant and their interaction with P.B. were investigated by topical application of O,O-dimethyl S-(1,2-dicarboethoxyethyl) dithio phosphate (malathion) and five of its analogs, each alone and with P.B. (1:10 by weight). Twenty-four hours after treatment mortality counts were recorded and LD50's were determined on log-probit analysis sheets.

The oxygen analog of malathion was synergized while malathion was antagonized by the presence of P.B. Compound 4128, having propyl ester molecular structure endings as compared with malathion's ethyl ester endings, was antagonized 2.0 times while malathion was antagonized 1.6 times. With malathion analogs it appears that the presence of methoxy-thiophosphoryl group is antagonized, while the methoxy-phosphoryl and ethoxythiophosphoryl groups are synergized. The structures of these compounds are illustrated.

The penetration studies were made with Carbide and Carbon Chemicals' Compound 7744 (an aryl urethane) and

P.B. as a synergist, and malathion and P.B. as an antagonist. Topical applications were made on groups of 100 flies. The flies were held at a constant temperature of $74\pm2^{\circ}$ F., for four time intervals, 6, 12, 18, and 24 hours, then extracted externally and internally with petroleum ether. Parallel groups treated with the same amount of P.B. alone were extracted also at these time intervals. The extracts were evaporated and the P.B. color complex developed with gallic acid and sulfuric acid and read on the "Spectronic 20" at 660 mu after two hours.

The rates of P.B. penetration alone and with the toxicant were generally the same. A difference in the percentage of P.B. penetration and metabolism was observed between the two different levels of P.B., the lower level penetrating and being metabolized more rapidly percentage wise than the higher concentration. The penetration rate of P.B. does not appear to determine its role as a synergist or antagonist.

57 pages. \$2.00. Mic 57-1128

705

| ABDEL-MEGUID, Adly Fahmy. A com- parative study of income tax administra- tion: Great Britain and Egypt. | XVII, 522 | BARNETT, Bobby Dale. Dietary factors affecting growth of chicks and turkey poults. | XVII, 460 | BUTLER, Edward Richard. Legal issues pertaining to the regulation of pupil con- trol interpreted in light of certain social | |
|---|------------------------|---|-----------|---|---|
| ABDUL-KARIM, Aziz F. A study of alkyd-silicone coatings. | XVII, 581 | BARROLL 3rd, John Leeds. Shakespeare and Roman history. | XVII, 626 | changes, 1828 to 1900. | XVII, 528 |
| ABERNETHY, Francis Edward. Popular literature and social protest, 1485-1558. | XVII, 619 | BARTHOLOME, Paul M. Structural and petrological studies in Hamilton County, New York. | XVII, 598 | | |
| ABO-EL-GHAR, Mohammed Ramadan. Comparative acaricidal responses of five species of spider mites. | XVII, 696 | BASS, Manuel Nathan. An interpretation of the geologic history of part of the | | CALL, Tracey Gillette. A pharmacog- nostical investigation of Pteryxia | |
| ACHEY, Frederick Augustus. X-ray fluorescence from thin films. | XVII, 509 | Timiskaming subprovince, Canada. BATSON, Essie Beatrice. The treatment of American history in the American | XVII, 598 | terebinthina (Hook.) Coult. & Rose var. terebinthina (a botanical, phytochemical, and pharmacological study). | XVII, 604 |
| ADAMS, Nathan. Fernão Lopes, late medieval Portuguese chronicler. | XVII, 607 | novel 1890-1910. BENNETT, Frank. The development of a | XVII, 619 | CANDELAS REYES, Gustavo Antonio. Studies on the freshwater plankton of | , |
| ALBRITTON, Rogers Garland. A study of Plato's Philebus. | XVII, 648 | workbook for classroom instruction in driver education (Parts I and II). | XVII, 528 | Puerto Rico. CARR, John Halden. The interference | XVII, 697 |
| ALEF, Gustave. A history of the Muscovite Civil War: the reign of Vasili II (1425-62). | XVII, 607 | BENNETT, William Hunter. Effect of stage of maturity, cutting treatment, and | | phenomenon with Newcastle disease virus. | XVII, 477 |
| ALLPORT, John J. Shock induced flow in narrow ducts. | XVII, 651 | fertilization on the yield and crude pro- tein, crude fiber, and ether extract con- tents of certain grasses and legumes. | XVII, 467 | CARTER, JR., John Archer. Dickens and education: the novelist as reformer. | XVII, 628 |
| ALMOS, Kermit Odell. A study of inter- relationships between measured satis- | | BIER, Jesse. A critical biography of John Peale Bishop. | XVII, 627 | CARTER, Melvin Winsor. Studies on the effect and mode of action of genistin on the growth of animals. | XVII, 493 |
| faction with college and certain academic and personality variables. AL-RUBAYI, Nouriddin Abdulla. Electri- | XVII, 561 | BJORKLAND, John Alexander. The influ- ence of radiation damage on the position | | CASON, James Lee. A study of digestion of cellulose and dry matter using "in | |
| cal phenomena in the pre-breakdown re- gion of CdS crystals. | XVII, 588 | annihilation lifetime in high-polymer plastics. BLACKBURN, James Robert. Concepts | XVII, 658 | vivo" and "in vitro" rumen techniques. CASSELBERRY, Henry Reutschlin. Pro- | XVII, 461 |
| AMANO, Akira. The specificity of metallic catalysts (Parts I-IV). | XVII, 509 | of driver education and their relative importance for a driver education course | | posed music offerings for the elementary curriculum based on the music experi- ence and knowledge of freshmen and | |
| ANDERS, James Marvin. The Senatorial career of John Tyler Morgan. | XVII, 609 | in the secondary school. BLACKMAN, Vernon Harold. Vibrational | XVII, 571 | graduates, Pennsylvania State Teachers Colleges. | XVII, 529 |
| ANDERSON, Irvin Charles. A study of the effects of manganese on the forma- tion and status of certain high-energy | | relaxation in oxygen and nitrogen. BLEYHL, Norris Arthur. A history of the production and marketing of rice in | XVII, 651 | CASTAGNO, JR., Alphonso Anthony. The development of the expansionist concepts in Italy (1861 to 1896). | XVII, 668 |
| phosphate compounds in plants. ANKORI, Zvi. Karaites in Byzantium: | XVII, 484 XVII, 608 | California. BLUMENTHAL, Werner Michael. Labor- | XVII, 525 | CAYLE, Theodore. The effect of wave- length on the distribution of C ¹⁴ in the | NAME 400 |
| the formative years (970-1100). ARMSTRONG, JR., Arthur Alexander. A | AVII, 000 | management relations in the German steel industry, 1947-54. | XVII, 519 | early products of photosynthesis. CHAHBAZI, Parviz. Prediction of | XVII, 486 |
| quantitative evaluation of the effect of edge losses and contact resistances in the determination of thermal properties | | BONINI, William Emory. Subsurface geology in the area of the Cape Fear Arch as determined by seismic- | | achievement in New York State College of Agriculture at Cornell University. CHALLAND, Helen Jean. An appraisal of | XVII, 562 |
| of solid materials by an unsteady-state method. | XVII, 581 | refraction measurements. BONNEAU, Loren Richard. An interview | XVII, 599 | elementary school science instruction in the state of Illinois. | XVII, 568 |
| ARMSTRONG, Fred Gartin. An experi- mental study of a structured interview for determining vocational interests. | XVII, 561 | for selecting teachers. BOYCE, Wallace Campbell. The problem | XVII, 537 | CHALOUPKA, Marilyn Marie. Interrela- tionships of diet and certain metabolic | |
| ASHLEY, Leonard R. N. The Theatre- Royal in Drury Lane, 1711-1716, under | | of the presence of the author in the novels of Francois Mauriac. | XVII, 628 | components, with particular reference to niacin and tryptophan. | XVII, 493 |
| Colley Cibber, Barton Booth, and Robert Wilks. | XVII, 625 | BRAU, Herminio M. Higher alcohols in the alcoholic distillation from fermented cane molasses. | XVII, 582 | CHASE, David Marion. Nucleon-nuclear wall interaction in scattering processes. | XVII, 658 |
| ASTUTO, Philip Louis. Francisco Javier Eugenio de Santa Cruz y Espejo: a man of the Enlightenment in Ecuador. | XVII, 626 | BRENNAN, James Francis. Degeneration of the mammillothalamic tract after | | CHASTAIN, JR., Elijah Denton. An empirical study of the decision-making process in farm management (Parts | NIII 455 |
| AUTHEMENT, Ray Paul. Sums of irreducible polynomials with coefficients | | ultrasonic irradiation. BRODY, Seymour Steven. Fluorescence | XVII, 475 | I-IV). CHELLMAN, John. An evaluation of the two year required program of physical | XVII, 455 |
| in GF(q). | XVII, 639 | life times of photosynthetic pigments in vivo and in vitro. | XVII, 484 | education for men at Emory University, Georgia. | XVII, 554 |
| | | BROWN, Anita Delores. Linguistic analys of St. Paul's Epistle to the Romans and Prologues to the Epistles in MS. I. 1. 2 | | CHRISTENSEN, John. The mechanism of periodate oxidation of simple sugars. | XVII, 494 |
| BACH, Shirley Rosenberg. The synthesis of protolichesterinic acid, dihydroproto- liehesterinic acid and lichesterinic acid methyl ester. | XVII, 501 | of the Library of the Escorial. BROWN, Paula McKinney. A comparative study of three therapy techniques used | XVII, 624 | CHRISTENSEN, Opal. The value of speed- forcing drills administered at the Work Station in improving typewriting pro- | |
| BADGER, Blanche Crisp. An analysis of the evolving evaluation program in elementary geometry. | XVII, 571 | to effect behavioral and social status changes in a group of institutionalized delinquent Negro boys. | XVII, 674 | ficiency and production. CLEARY, Laurence Twomey. Fire retardant investigations of phosphorylated | XVII, 520 |
| BAILEY, John Marvin. The economics of scale in commercial egg production, New | | BOTTEI, Rudolph S. The use of chromous chloride in organic functional group analysis. | XVII, 492 | aminoethyl cellulose structures. CLIFT, William Orrin. Sedimentary | XVII, 580 |
| York State, 1954-55. | XVII, 455 | BUBIENIEC, Ernest Julian. Chemical and physical factors determining develop- | | history of the Ogaden district, Ethiopia. | XVII, 600 |
| BAIN, Chester Arthur. The history of Viet-Nam from the French penetration to 1939 (Parts I-III). | XVII, 610 | ment of apothecia in the homothallic fungus Pyronema omphalodes. BURROWS, Reynold Lawrence. Prolego- | XVII, 485 | CLUBB, William Graham. Molière and the baroque rhythm. | XVII, 629 |
| BAKER, Donald Roy. Geology of the Edison area, Sussex County, New Jersey (Parts I-III). | XVII, 597 | mena to Herodian; translation and textual commentary to Books II. 9. I — III. 15. | XVII. 624 | COCANOUGHER, LaRue. An analysis of pupil transportation cost deviations in selected Kentucky school districts. | XVII, 538 |

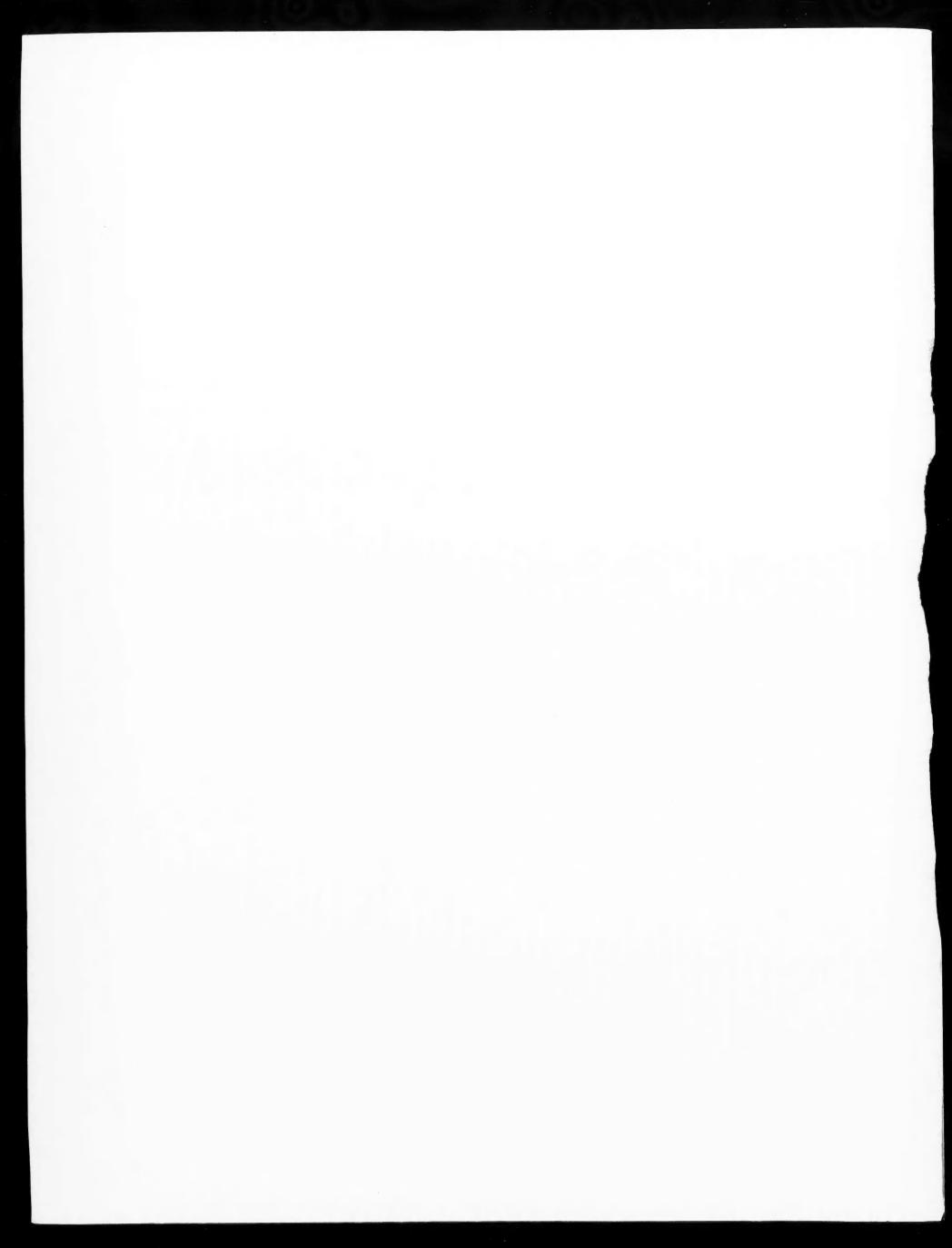
| COHEN, Bernard Brachya. Certain psychological factors associated with acculturation: a study of the relation- ship between survivalist, assimilation- | | DRINKARD, JR., William Charles. Studies on the oxidative and thermal stability of complex inorganic compounds (Parts I- III). | XVII, 499 | FRASER, James Mattison. Equilibrium and recovery studies on nitrogen oxides, and the heterogeneous decomposition of nitric oxide. | хvп, | 511 |
|--|------------------------|--|-----------|--|-------|--------|
| ist, and indifferent attitudes among members of an ethnic minority, and certain psychological factors. | XVII, 670 | DRUCKER, Melvin Bruce. "Authority" and "ingroup" standards, and conformity | XVII, 687 | FRAZEE, Lora Miller. Problems and adjustments caused by having student teachers in public elementary schools. | xvii, | |
| COHEN, Stephen Robert. The association of ferrocyanide ions with various cations. | XVII, 510 | DUFFEY, Dick. The irradiation of poly- vinyl methyl ether with electrons and | | FRIEDMAN, Bernard Hertz. Economic aspects of the conservation of soil, | | |
| COLE, Clarence Lorraine. The inter- action of breeding and levels of nutrition in swine (different crosses of inbreds subjected to varied levels of feeding a | | gamma rays to form elastomers. DUNBAR, Gary Seamans. Historical geography of the North Carolina Outer Banks. | XVII, 583 | water, and timber resources. FRIEDMAN, Harry J. Consolidation of India since independence: a comparison | XVII, | 517 |
| balanced ration). CONNELLY, JR., John Joseph. Effect of | XVII, 461 | DUWALL, Mary Irene. The effect of manifest anxiety upon incidental and | | and analysis of four Indian territorial problems—the Portuguese possessions, the French possessions, Hyderabad and Kashmir. | xvII, | 660 |
| very high centrifugal fields on the rate of self-diffusion of polycrystalline silver. | XVII, 651 | new task learning. DWYER, John A. Some factors influencing public opinion on free schools in Pennsyl- | XVII, 680 | FUJITA, Yuzuru. Built-up column strength. | xvII, | |
| COOPER, Wilmer Albert. Rufus M. Jones and the contemporary Quaker view of man. | XVII, 685 | vania, 1800-1835. | XVII, 530 | FULKERSON, John Frederick. Botyrosphaeria ribis and its relation to a rot of apple. | XVII, | 475 |
| COPE, Will Allen. Inheritance of rust resistance in alfalfa. | XVII, 481 | | | FULLER, Milton Eugene. The relative reactivities of some alkyl groups. | xvII, | |
| COTTER, Donald James. Some observa- tions on black spot of potatoes. | XVII, 467 | EASTMAN, Daniel. Self acceptance and marital happiness. | XVII, 675 | reactivities of some anyl groups. | AVII, | 302 |
| COUCH, Carl James. A study of the relationships between self-views and role-taking accuracy. | XVII, 687 | EDMONDSON, Vance Ward. Farm business adjustments on commercial dairy farms, Montgomery County, New York, 1944-45 | 3 | | | |
| COUTTS, Eleanor Jean. The life and works of William Alabaster, 1568- | AVII, 001 | and 1954-55. EHRLICH, Howard George. Cytological studies in Saintpaulia Wendl. | XVII, 456 | GABBARD, Richard Bruce. Analogues of tetracycline. GABRIELSEN, Bramwell W. An analysis | хvп, | 508 |
| 1640. COWGILL, Bruce Eric. Factors influencing the success, or failure, of administra- | XVII, 620 | (Gesneriaceae). EILBIRT, Henry. An analysis of the | XVII, 487 | of the incidents related to water fatalities occurring in the United States. | xvII, | , 692 |
| tors in Nebraska's Class III School Districts. | XVII, 539 | changes in employee counseling since 1900. EISEMANN, Carl. A restudy of the school | XVII, 521 | GAFFNEY, Louis B. Likes and dislikes of college students in relation to adjustment and achievement. | хvп, | , 671 |
| CRAIG, Robert Leslie. The effect of hypophysectomy on experimental ascites. | XVII, 605 | districts in two rural communities to determine the effects of reorganization. | XVII, 539 | GANS, Eugene Howard. The solubility and complexing properties of oxytetracycline and tetracycline. | XVII, | 604 |
| CRAWFORD, Robert James. The prepara- tion and rearrangement of some cyclo- hexadienones. | XVII, 501 | EISEN, Fred Henry. Self-diffusion in indium antimonide and gallium antimonide. | XVII, 652 | GARRISON, Martin Byron. An analysis of the preparation program in educational administration at George Peabody Col- | | |
| CRAYTON, Philip Hastings. The proper- ties and structure of some diethylene- triamine cobalt complexes. | XVII, 490 | chemical analysis of Abies grandis (Dougl.) Lindl. with particular reference to decay by Echinodontium tinctorium | | lege for Teachers. GEIL, JR., Phillip Herbert. Application of small angle X-ray scattering to the | XVII, | , 540 |
| CULP, James William. The judgment denouement of English Renaissance comedy from 1553 to 1625. | XVII, 621 | (Ellis) E. and E. | XVII, 465 | determination of the structure of macromolecules. | xvII, | , 652 |
| CURRAN, Carleton Edgar. The Corps Législatif during the supremacy of Napoléon the First, 1799-1813. | XVII, 611 | EACWI ED Minion Engating Double | | GERKEN, John M. A study of the notch sensitivity of the weld heat-affected zones in some titanium alloys and MN- MO armor steels. | XVII, | . 590 |
| Napoteon the First, 1799-1015. | AVII, 011 | FACKLER, Miriam Ernestine. Death: idea and image in some later Victorian lyrists. | XVII, 621 | GIBSON, William Wallace. Biological and ecological studies of the wheat curl mite, | | , 000 |
| DAVIG V Clearly Applicate of a section | | FAHEY, Frank Michael. Denis Kearney, a study in demagoguery. | XVII, 611 | Aceria tulipae (K.), on winter wheat in Kansas. | хvп, | , 697 |
| DAVIS, I. Clark. Analysis of a graduate program for college student personnel work based on determined criteria. | XVII, 572 | FAILS, Emol Atwood. The potential role of public community junior colleges. FARGO, Adeeb F. Compatibility of the | XVII, 573 | GLASS, Robert Louis. Chemical, physical, and biological studies of rats' milk and its components. | xvII, | 494 |
| DEBBAGH, Khalid Abdulkadir. Tobacco anthracnose: etiology, sources of resist- ance, and host-parasite relationships. | XVII, 486 | cultural heritage and education in Iraq. FARRAR, Luther L. Studies on the ratoon | XVII, 530 | GLEASON, Gerald Thomas. A study of the relationship between variability in physical growth and academic achieve- | | |
| de GALÍNDEZ, Jesús. Trujillo's Domini- can Republic: a case study of Latin American dictatorship. | XVII, 663 | stunting disease of sugarcane in Louisiana. FATHI, Karim Matta. John Stuart Mill's | XVII, 474 | ment among third and fifth grade children. | хvп, | , 563 |
| DÉGEILH, Robert. Crystal structure studies of iron cupferron and 2,2'- | | theories of universals in relation to his different theories of universal proposi- tions. | XVII, 648 | GOODWIN, DuWayne LeRoy. Autecologica studies of <u>Artemisia tridentata</u> Nutt. | | , 487 |
| biquinoline. DiANTONIO, Gus. Summability of double series by Abelian methods. | XVII, 510 XVII, 639 | FLESNER, Dorris Aldo. The role of the Lutheran churches of America in the | | GOODWIN, Louis Charles. A historical study of accreditation in Negro public and private colleges, 1927-1952—with | | |
| DICKERSON, Richard T. The reaction of aromatic sulfinic esters with hydrogen chloride and chloride ion. | XVII, 502 | formation of the World Council of Churches. | XVII, 686 | special reference to colleges in the Southern Association. | XVII, | , 541 |
| DiPIETRO, Alphonso Joseph. A program in mathematics education for West | AT 11, 502 | FLOURNOY, Houston Irvine. The Liberal party in New York State. | XVII, 663 | GORDON, Robert Edward. The biology and biodemography of <u>Anolis carolinensis</u> carolinensis Voigt. | | , 698 |
| Virginia teachers of secondary mathematics. DODSON, Leonard Edwin. The effect of | XVII, 569 | FOGELMAN, Edwin. Foundations of English constitutional theory: an inter- pretation of the relation between politi- | | GOSSLEE, David Gilbert. Level of | | |
| written orientation material upon client satisfaction with the initial vocational counseling interview. | XVII, 563 | cal philosophy and constitutional theory in modern England. | XVII, 664 | significance and power of the unweighted means' test. | | , 640 |
| DRESCHER, Robert Fredrick. The relation of certain microorganisms to the plugging of paper machine wet felts. | | FRAIOLI, Anthony Vincent. A study of the interactions of polar organic mole- cules with metal and metal oxide surfaces. | XVII, 490 | GRAHAM, Bernice Carter. Adaptation of the tannic acid hemagglutination test for use in the study of Hemophilus pertussis antigens and antibody. | 3 | I, 478 |
| properties of paper machine wet letts. | XVII, 478 | Sur races. | , 100 | and | WAL | -, 410 |

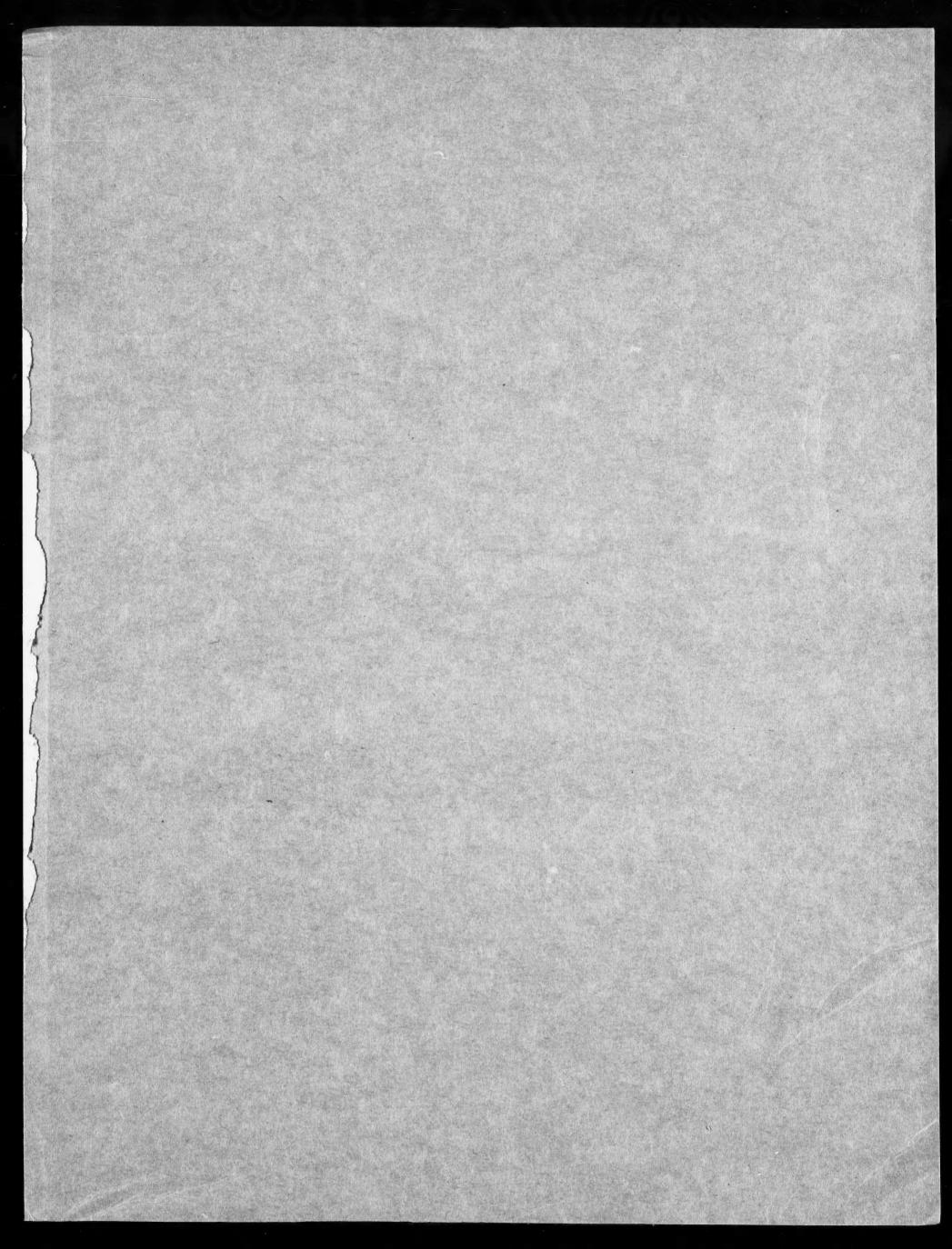
| GRAHAM, Julian Burns. A history of the | XVII, 659 | HOFSTETTER, Arthur Newsome. Impli- cations of The Greenbrier County Study for school administrative staff opera- tion. | XVII, 542 | KEELER, Harold Jay. Predicting teacher effectiveness of graduates of the State University of New York Teachers Col- leges. | XVII, 545 |
|--|-----------------------------|---|------------------------|--|----------------|
| years of agrarian unrest, 1865-1896, prepared for high school use (Parts I and II). | XVII, 612 | HOLLOWAY, JR., Harry Lee. Notes on the helminths of mammals in the | XVII, 700 | KELLEHER, Therese Marie. Analysis and interpretation of variation of inbred lines and F_1 crosses in corn. | XVII, 482 |
| | | HORNE, JR., James Grady. Concerning o-ideals. HOUGHTON, Hubert Whitney. The role of the counselor as perceived by seniors. | XVII, 640 | KELLY, Eldon G. A study of the dis- crepancies between instructor grades and term-end examination grades among basic college students at Michigan State | |
| HACHEY, R.S.M., Sister Mary Mercedes. An investigation and evaluation of two interpretations of St. Thomas' doctrine on the objectivity of the concept. | XVII, 649 | administrators, teachers and counselors in selected New York State public high | XVII, 574 | University. KENNEDY, Steele Mabon. Emerson's "The American Scholar," and the | XVII, 564 |
| HALL, George Lincoln. Anisotropic strain near a vacancy or an interstitial in Lennard-Jones crystals. | XVII, 652 | analysis of the spiritual and moral values in camping. HUNNICUTT, Theo M. Defining and pro- | XVII, 555 | other Harvard Phi Beta Kappa orations. KENT, Howard Robert. The effect of repeated praise or blame on the work | XVII, 632 |
| HALL, Maclin Schnelle. The similarity principle and electric field strengths in high-frequency gas discharges. | XVII, 655 | jecting the office of the Dean of Women | XVII, 543 | achievement of blind children. KETCHESON, John William. Studies of soil phosphorus forms in two non- | XVII, 675 |
| HALPERIN, Samuel. American Zionism: the building of a political interest group. HALSEY, Hugh. The predictive value of | XVII, 665 | hundred student autobiographies (Volumes One and Two). HUTCHESON, JR., Thomas Barksdale. | XVII, 532 | calcareous Ontario soils. KING, Kenneth M Pasture irrigation control according to soil and meteorological | XVII, 469 |
| certain measures used in selecting freshmen for the technical curricula in a community college. | XVII, 542 | Sodium and potassium interrelationships in soil and mineral systems and their effects upon the nutrition of flue-cured | 100 | measurements. KING, William Browning. Certain critical requirements for the secondary school counselor determined from an analysis | XVII, 469 |
| HANAI, Tetsuro. Studies on the Ostracoda from Japan: I Subfamilies Leptocytherinae, n. subfam., "Toulmini- inae", n. subfam., and Cytherurinae G. | | tobacco. HUTTAR, Charles Adolph. English metrical paraphrases of the psalms, | XVII, 468 | of critical incidents reported by teachers. KITE, Loyd Bowie. Public school legisla- | XVII, 575 |
| W. Muller. | XVII, 600 | 1500-1640. | XVII, 631 | tion in Mississippi, 1930 to 1955. | XVII, 545 |
| HARTMAN, James Austin. Titanium | XVII, 574 | | | KLAEGER, Max Ludwig. A comparative study of the preparation of art teachers for American and German secondary schools. | XVII, 569 |
| HAZLEHURST, Franklin Hamilton. Jacques Boyceau, Sieur de la Barauderie: the | XVII, 601 s XVII, 593 | INCHIOSA, JR., Mario Anthony. The influence of oxytocin and epinephrine upon uterine motility and metabolism. | XVII, 660 | KLUGE, Robert Botts. Developmental tasks: middle adolescent peer culture tasks as observed in two selected en- | , |
| HAYNES, Lawrence Wilber. An analysis of the ice cream industry as an outlet | , | INGWELL, Paul Elmer. The present status of the program of studies in pub- licly-supported junior colleges in the | | vironments, a high school and a com- munity youth center. | XVII, 565 |
| for dairy products. | XVII, 517 | United States. | XVII, 532 | KNAPP, Gordon Grayson. Synthetic ap- proaches to the yohimbine system. | XVII, 502 |
| HEBERT, Leo Placide. Breeding behavior of certain agronomic characters in progenies of sugarcane crosses. HEARST, Eliot Sanford. The behavioral | XVII, 468 | IYENGAR, Shanta Venkatesa. The production of mutations by chemical treatments of the polar cap of <u>Drosophila melanogaster</u> . | XVII, 700 | KNAPP, Henry William. Influences of school size and consistency of instruc- tion on achievement in English and his- tory of 1954 graduates of small Montana | |
| effects of some temporally-defined schedules of reinforcement. HEINBERG, Paul. An experimental in- | XVII, 680 | | | high schools. KNIPMEYER, William Bernard. Settlement succession in eastern French | XVII, 576 |
| vestigation of methods of measuring diction. | XVII, 693 | JACOBS, Jean Gillis. A study of high | | Louisiana. KOCH, Albert Winfield. A comparative | XVII, 596 |
| HELGESEN, Moira Anne (Curr). Forgues: nineteenth century Anglophile. HEMSTREET, JR., Harold William. The | XVII, 629 | school girls' interscholastic basketball in Tennessee. JANDOLI, Russell Jermoe. Journalism | XVII, 555 | study of the auditory thresholds of spastic cerebral palsied adults and non-handi- capped adults as measured by standard | |
| low temperature hall effect in single crystals on beryllium and zinc. HENRICKSON, Eiler Leonard. A study of | XVII, 656 | education and the social sciences: an analysis of recent educational thought regarding social studies instruction for | | audiometric and psychogalvanic skin resistance procedures. KOCHMAN, JR., Andrew John. Realism | XVII, 565 |
| the metamorphism of the Upper Huronian rocks of the western portion of the Marquette district, northern peninsula, | | students in schools and departments of journalism in the United States. JACOBS, Harvey. A kinetic study of the | XVII, 618 | in the early and middle nineteenth century British Theatre. KOEHLER, JR., John. Acquisition and | XVII, 693 |
| Michigan. HENRY, Patrick Mark. The reactions of Cobalt(III) complexes in various solvents. | XVII, 601 | acid- and base-catalyzed hydrolysis of 2- and 5-formamido-, acetamido- and benzamidopyrimidine. | XVII, 513 | extinction of a running response as a function of the percentage of reinforce- ment and the number of acquisition | |
| HENRY, William Ray. Optimum shipping patterns and intermarket price relationships for commercial broilers. | XVII, 457 | JEMIAN, Wartan A. Adhesion and bond- ing of coatings on metals. JENSEN, Gordon Maurice. The National | XVII, 591 | trials. KOGAN, Abraham. On rotational inviscid flow generated by airfoils or bodies of | XVII, 681 |
| HEPPE, Paul Harry. The Liberal party of Canada. | XVII, 665 | Civic Federation: American business in an age of social change and social re- | YVII 612 | revolution placed symmetrically in a supersonic stream (Parts I and II). KOHN, Joseph John. A non-self-adjoint | XVII, 580 |
| HESELTINE, Harry Payne. The development of the Fitzgerald hero. | XVII, 630 | form, 1900-1910. JOHNSON, Joseph Clyde. The effect of amount and timing of knowledge of re- | XVII, 613 | boundary value problem on pseudo- Kähler manifolds. KORONAKOS, Chris. Inferential learning | XVII, 641 |
| HILL, Richard Lee. Kinetics of the reaction of primary amines with piperonal. | XVII, 512 | sults upon learning a motor skill. JORDAN, Wayne Noll. Planning music facilities for the secondary schools. | XVII, 681 XVII, 544 | in rats: the problem-solving assembly obehavior segments. | f XVII, 682 |
| HOERMANN, Roland William. The Roman- tic myth of the artist's regeneration and its expression in the symbolism of Achim yon Arnim's prose. | | | | KRANES, Judith Ehre. A study of children's allowances in the eight, eleven, and fourteen year-old groups in a selected New York City private school. | XVII, 566 |
| HOFFMAN, Roger Alan. A comparison of the activity and morphology of the thyroid gland of a hibernator and a non- | , 500 | KARST, Otto J. Linear regression using least absolute values. | XVII, 641 | KREINEN, Fannie. A music syllabus for Jewish All-Day schools (Parts I and II). KROPF, Donald Harris. The effect of protein quality and supplementation of | XVII, 533 |
| hibernator with a study of the morphological changes in the pituitary gland of the hibernator. | XVII, 699 | KATAYAMA, Hiroya. Japan's balance of international payments between 1924 and 1936. | XVII, 523 | swine rations with lysine and tryptophan upon nitrogen metabolism, growth and carcass composition of swine. | XVII, 462 |

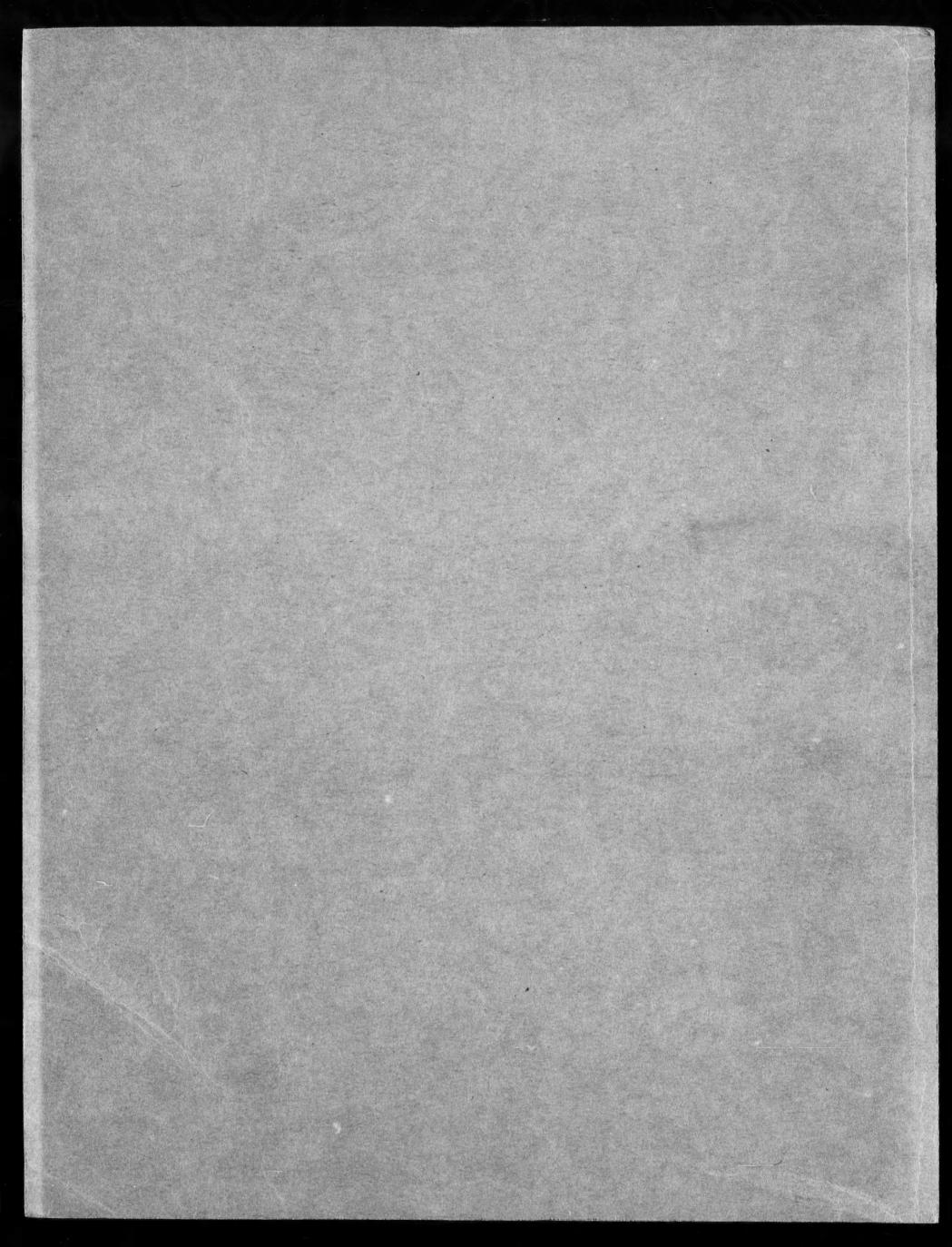
| KUHN, Joseph A. Description of the functions of the director of guidance in the public high schools in Nassau County, | | LOWDENSLAGER, David Barrington. Duality in partially ordered vector spaces. | XVII, 642 | MEIER, Manfred John. Interrelationships among MMPI variables, kinesthetic fig- ural aftereffect, and reminiscence in | |
|---|-----------|---|-----------|---|-----------|
| New York, with recommendations. KURTZ, Ann White. C. M. Wieland and | XVII, 546 | LUECKING, Evelyn Mildred. A descrip- tive analysis of a three year core pro- | , | motor learning. MELNYKOVYCH, George. A study of the | XVII, 678 |
| the <u>Teutscher Merkur</u> 1773-1789. KURTZ, Thomas Eugene. An extension | XVII, 632 | gram and an appraisal of its educational | XVII, 577 | effects of antibiotics on the formation of amines by intestinal bacteria and their | |
| of a multiple comparisons procedure. | XVII, 642 | LUNDHOLM, JR., Joseph Gideon. Posi- tron lifetime in plastics as a function | | importance in the nutrition of the young rat. | XVII, 479 |
| KUSHWAHA, Ram Singh. The evolution of early main sequence stars. | XVII, 476 | | XVII, 659 | MELTZER, Alan S. A spectroscopic investigation of Algol. | XVII, 477 |
| | | | XVII, 613 | MILLER, Johnny Jerome. Competitive athletics in the elementary schools of | |
| LANDESMAN, Hans Kurt. I. The alkylation of eneamines. II. Synthesis of 2,3-dimethoxy 1-carbomethoxy-1,3- | | MACDONALD, James Bradley. Some | | Davidson County, Tennessee. MILLER, Myron S. An analysis of clinical cases and non-clinical cases as determined by an arithmetic proficiency test. | XVII, 557 |
| butadiene. | XVII, 503 | contributions of a general behavior theory for curriculum. | XVII, 577 | MILLS, Jack. Horace Walpole as a | |
| LANNING, Frank W. Selected factors of group interaction and their relation with | WITT OF | MACHI, Vincent Sebastian. An analysis | 1112, 011 | critic of British public address. MOLNAR, George Dempster. Studies on | XVII, 694 |
| LARIS, Philip Charles. Permeability and | XVII, 671 | of inter-person correlations among thirty psychotics. | XVII, 683 | radioiodine uptake in surviving human thyroid slices. | XVII, 603 |
| utilization of glucose in mammalian erythrocytes. | XVII, 661 | MACY, Murray. The effectiveness of representative materials and additional | | MOLNAR, Simon J. A study of physical education teaching competencies needed | |
| LARSON, Clifford Emil. The locational orientation of industry to markets. | XVII, 521 | experience situations in the learning and teaching of fourth-grade mathematics. | XVII, 533 | by elementary classroom teachers: as applied to the State University Teachers | |
| LASSAR, Benedict Taxier. A study of the | | MALAMUD, Daniel I. Differences in the early childhood memories of authori- | | College Potsdam, New York. MONSON, William Lamon. Battery studies | XVII, 558 |
| effects of group discussion on the atti- tudes of mothers toward their cerebral palsied children: an investigation of the | | tarian and nonauthoritarian personalities. MALLIN, Morton Lewis. Studies on the relationship of hydrogen peroxide to | XVII, 672 | with particular reference to organic depolarizers. | XVII, 583 |
| attitudes of mothers of cerebral palsied children and the effects of group dis- | | respiration in Clostridium perfringens. | XVII, 496 | MORGAN, Paul Claude. Promising prac- tices in scheduling cocurricular activitie | |
| cussion on these attitudes. LAWSON, William Burrows. The syn- | XVII, 676 | MARCUS, Abraham. Studies with fluoro- acetate, fluoroacetyl coenzyme A and | | in secondary schools. MORRISON, Robert Dean. Some studies | XVII, 547 |
| thesis and polymerization of bicyclic dienes, and bromides related to the | | fluoroacetyl phosphate. MARCUS, Erich. The steric effects of | XVII, 497 | on the estimates of the exponents in models containing one and two | |
| Diels-Alder adduct of cyclopentadiene and maleic anhydride. | XVII, 504 | methylene groups. MARTIN, Robert Emmett. The educa- | XVII, 504 | exponentials. MOULTRIE, JR., James Young. Promis- | XVII, 643 |
| LAXAR, Francis Harold. The relationship of plastic fatigue resistance to mechani- cal properties and microstructure of | | tional implications of an individual longitudinal case inventory. | XVII, 578 | ing practices in Alabama high schools indicated by Evaluative Criteria reports | XVII, 534 |
| steels. | XVII, 591 | MARTIN, William C. The energy levels and spectra of neutral and single ionized | 10111 050 | MUMPHREY, Anthony. A study of the teaching activities of teachers of voca- tional agriculture in Louisiana high | |
| LE BRIE, Stephen J. An experimental study of some of the factors involved in tourniquet shock in rats. | XVII, 661 | phosphorus (Parts I-IV). MASTERTON, George. Friendship as a situational phenomenon: a study of | XVII, 653 | schools. MUN, Alton M. A study of the toxicity of | XVII, 458 |
| LEVIN, Marshall David. The compara- tive value of different pollens in the | | friendship among college freshmen. MATHERS, Aubra Clinton. The role of | XVII, 689 | normal rabbit serum and antiserum on the 72 hour chick embryo, in ovo. | XVII, 701 |
| nutrition of Osmia lignaria Say (Hymenoptera-Apoidea). | XVII, 701 | aluminum in ion exchange reactions of acid soils and clays. | XVII, 471 | MYINT, Saw Tha. Embryological studies of certain teleost fishes with special | |
| LEVENTHAL, Donald Becker. Conceptual behavior in schizophrenics and brain- damaged patients: an analysis of object | | MATHEW, Karimpanamannil Chacko. Radhakrishnan's and Brunner's anthropologies: a comparison. | XVII, 650 | reference to the possible significance of melanophores in piscine taxonomy. | XVII, 702 |
| sorting, block substitution, synonyms, and similarities tasks. | XVII, 677 | MAULE, Mary-Eleanor. Modernismo in two Spanish American novelists: | , | | |
| LEVINE, Nathan Melvin. The physical factors governing the leaching of ores. | XVII, 592 | Carlos Reyles and Pedro Prado. | XVII, 633 | | |
| LIBA, Marie Rose. Factors affecting reliability of measures of motor | | MAYERS, Eugene David. Some modern theories of natural law. MAZELAUSKAS (Maze) O.S.F., Sister M. | XVII, 650 | NAYLOR, Floyd Edmond. The synthesis of α-alkyl acrylic monomers and sulfurcontaining olefins by the pyrolysis of | |
| performance. LIMAYE, Madhav Rajaram. Inheritance | XVII, 556 | Gabrielle. An histological study of the origin and development of insect induced | | acetates. NEELY, Thomas Alexander. Synthesis of | XVII, 505 |
| of fiber density in a hybrid between Upland and Sea Island cotton. | XVII, 470 | galls of the goldenrod blossom. McCLUER, Blanche Warren. An evalua- | XVII, 488 | alkylated polycyclic hydrocarbons: I. Some methyl substituted triphenylenes. | XVII, 505 |
| LINDBERG, John Monson. Symbolic presentation of ideas in Carlyle. | XVII, 622 | tion of some outcomes of general and educational psychology courses for | | NELSON, Agnes Denman. A study of the English speech of the Hungarians of | |
| LINENTHAL, Eleanor Tabor. Freedom of speech and the power of courts and Congress to punish for contempt. | XVII, 666 | education students. McCOURT, Andrew Wahlert. Aspects of | XVII, 673 | Albany, Livingston Parish, Louisiana. | XVII, 694 |
| LISK, Donald James. Studies on the chemical composition of soil solution. | | the linearized equations of aircraft motion used in flight control system design. | XVII, 588 | NEW, John Gabriel. New techniques, using dyes, for studying the movements of small mammals. | XVII, 702 |
| LLOYD, Norman Edward. The fraction- ation and characterization of corn endo- sperm proteins. | XVII, 495 | McINTYRE, Stuart Hall. Legal effect of World War II on treaties of the United | | NEWMAN, Michael. Personality differences between volunteers and non- | |
| LOKEN, Merle Kenneth. The effects of | AVII, 100 | States. | XVII, 669 | volunteers for psychological investiga- tions: self-actualization of volunteers | |
| roentgen rays on several biological systems with special reference to their modification by hematoporphyrin. | XVII, 496 | McKENZIE, Lionel W. Application of activity analysis to the theory of general equilibrium. | XVII, 526 | and non-volunteers for researches in personality and perception. | XVII, 684 |
| LONG, Robert Irvin. The effect of the amount and distribution of warming-up | | McVICKER, JR., Charles Potter. Titoism: | | NEWMAN, Robert James. Hour-to-hour variation in the volume of nocturnal | W7.00 |
| amount and distribution of warming-up activity on original learning and retention. | XVII, 683 | changes in ideology and policy since 1950 (Parts I-III). | XVII, 667 | migration in autumn. NYGAARD, Joseph Magnus. The shared | XVII, 703 |
| LOW, Donald Gottlob. Experimental canine leptospirosis. | XVII, 603 | MEADER, Roland Darrell. A histologic study of choline deficiency in the mouse. | XVII, 476 | income tax and school support in Wisconsin. | XVII, 547 |
| 4.18 | | | | | |

| O'HARE, Charles Bernard. The role of European literature in the prose works of D. H. Lawrence. | хvп, | 634 | RAMON, Michel Robert. Nueva interpre- tacion del picaro y de la novela picaresca española hecha a base de un estudio de | | | SCHÖNBACH, Peter Michael. Need, relevance of ideation, force and time estimation. | XVII, 684 |
|---|-------|-------|---|-------|-------|---|-----------|
| OLSON, Esther Judith. An analysis of the Nietzschean elements in the plays | xvII, | 605 | RAMOS, José Antonio. Review of the | xvII, | 635 | SCHRIER, Arnold. Ireland and the American emigration, 1850-1900. | XVII, 615 |
| of Eugene O'Neill. O'MALLEY, Glenn E. Synesthetic expres- | | | auchenorhynchous Homoptera of Puerto Rico. Part III. Kinnaridae, Cercopidae, Membracidae and Cicadidae. | vvn | 503 | SCHROEDER, Harry William. Factors affecting resistance of wheat to scab | |
| sion in Shelley's verse. OROFINO, Thomas Allan. The relationship of the second virial coefficient to | XVII, | 034 | REED, Lawrence Lee. A study on the biological activity of two thermophilic | XVII, | , 593 | caused by Gibberella zeae (Schw.) Petch. SCHUBERT, S.J., Clarence C. The oxida- | XVII, 473 |
| polymer chain dimensions and interaction parameters. | xvII, | 513 | | хvп, | 480 | | XVII, 514 |
| OSMUN, John Vincent. The response of the eastern subterranean termite, Reticulitermes flavipes (Kollar), to | | | REINHART, Bruce Lloyd. Harmonic integrals on almost product manifolds. REISNER, Gerald Seymour. Studies on the | XVII, | 644 | SCHWARZ, E. Terry. A study of begin- ning teachers—problems encountered and services sought. | XVII, 535 |
| certain insecticides. OUTHOUSE, James Burton. Influence of | XVII, | , 592 | manganese nutrition of <u>Chlorella</u> , with special reference to nitrogen metabolism. | xvII, | 488 | SCRIBNER, Richard Merrill. Cyclopro- panes XV: 1-benzoyl-6-nitrobicyclo- | |
| diet on ketosis in sheep. | хvп, | 463 | REISNER, Martin. A comparative investi- gation of personality factors associated | | | | XVII, 507 |
| DACKARD Boss LoBoss Foological | | | with appropriate and inappropriate levels of vocational aspiration. | XVII, | 678 | SEARLE, Leonard. A study of three shell stars. SELLSTROM, Albert Donald. Heroic | XVII, 477 |
| PACKARD, Ross LeRoy. Ecological geography of certain Wisconsin feed crops. | хvп | . 471 | REYES, Gustavo Antonio Candelas. Please see CANDELAS REYES, Gustavo Antonio. | | | rhetoric and the theater of Pierre | XVII, 636 |
| PAINE, Robert Nelson. Economics and ethics in English novels between 1719 | | | RIDDELL, John Alan. Studies on the responses of spring wheat varieties to temperature and daylength (Parts I-IV). | XVII, | 472 | SESHU, Lily Hannah. On the number of simultaneous representations of a given | |
| and 1771. PARKE, David Maxwell. An investigation | XVII | , 622 | RIDDLE, Donald H. The Truman Com- mittee: a study in Congressional- | | | | XVII, 644 |
| of time dependent thermoelastic prob- lems using integral transforms. PASCUAL, Octavius Santos. Effects of | XVII, | 590 | RINGER, Benjamin Bernard. The | XVII, | 667 | SHADOWEN, Herbert Edwin. Rodent population dynamics in uncultivated fields of Louisiana. | XVII, 704 |
| ring size on addition reactions of methylenecycloalkanes. | xvII, | 491 | parishioner and his church: a study in the sociology of religion. | XVII, | , 690 | SHARP, Ansel Miree. A study of the counter-cyclical aspects of total govern- | |
| PASEWARK, William Robert. The effec- tiveness of television as a medium of | | | ROBERTS, Irene Emilie Witzke. Practices and attitudes of homemakers in cleaning the living room. | XVII | , 617 | ment fiscal policy, 1929-1940. SHARP, Gerald White. Small-angle x-ray | XVII, 524 |
| learning typewriting. PEARSON, Robert Jefferson. Public relations research concerned with public | XVII, | , 579 | ROBINSON, Prezell Russell. An analysis of faculty personnel policies in selected | | | scattering from copper-nickel diffusion couples. | XVII, 653 |
| elementary and secondary schools. PECH, Stanley Zdeněk. The role of | XVII, | , 548 | ROGERS, William P. A determination | XVII, | 550 | SIEGEL, Paul Benjamin. Phenotypic differences within late feathering chicks and estimates of heritability within | |
| František L. Rieger in nineteenth cen- tury Czech political development. | xvII, | 609 | of the prevalence of certain important general science misconceptions among ninth and tenth grade school children. | XVII, | 535 | early feathering chicks. SIMKINS, Stanton Wayne. A study of the | XVII, 482 |
| PERKINS, JR., Hugh Victor. A study of selected factors influencing perceptions of and changes in children's self- | | | ROOT, Donald Francis. Kinetics of the acid catalyzed conversion of xylose | xvII, | | admission variables used in the selection of candidates for the doctoral program of the School of Education of the University of Pittsburgh. | |
| concepts. PETERS, Elroy John. The influence of several managerial treatments upon the | xvII, | | ROSEN, Charles Abraham. Analysis and design of ceramic transformers and filter elements. | XVII, | 590 | SIMPSON, Lloyd S. The generation and propagation of short crested Gaussian | |
| gross morphology of timothy. PIERCE, John Eugene. The development | XVII, | 471 | ROTH, Edwin Neal. The synthesis and evaluation of new insecticides. | XVII, | | waves in a moving fetch. SIMS, James Redding. A study of pre- | XVII, 658 |
| of comprehensive insurance for the household: a process of integration (Parts I-III). | xvII | 523 | ROTHBARD, Murray Newton. The Panic of 1819: contemporary opinion and policy. | | | stressed metal structures for buildings. SINGH, Hridaya Nath. Breeding behavior | XVII, 586 |
| PIES, Frank J. A study of the Sunday schools of the National Evangelical | | | or acceptance of the control of the | , | - | of fiber in sugarcane. SIRKIS, Murray Donald. A high-energy | XVII, 474 |
| Lutheran Church. PLAZEK, Donald John. Dynamic mechani- | XVII | , 549 | SANDS, Elizabeth Grunbaum. Die Gestalt | | | electronics approach to the generation of radiation at millimeter wavelengths. SKARSTEN, Arlin Keith. Edmund Burke | XVII, 656 |
| cal properties of cellulose nitrate solu- tions and gels. | XVII, | , 514 | | XVII, | 636 | as literary critic and esthetic theorist. SKEEN, James Robert. Some effects of | XVII, 637 |
| POLLAN, William D. Stability of interest of college students. POOLE, William Hope. Geology of the | xvII | , 673 | SANTOS, Nilza Coni Caldas. A study of Thorndike's theory of mind and mental discipline. | xvII, | 567 | varying control-display relationships in a discrete tracking task. | XVII, 685 |
| Cassiar Mountains in the vicinity of the Yukon-British Columbia boundary. | xvn, | 602 | SARASON, Barbara Ryrholm. The effects of verbally conditioned response classes | | | SLATER, Charles Clifford. Market organization and competition in the | |
| PORTER, Donald Henry. Two-dimensional bounded variation and absolute continuity. | xvII | 643 | on post-conditioning tasks. SAUERS, Ronald Raymond. I. The course of formic acid reduction of enamines. | XVII, | , 679 | perishable products baking industry. SMITH, Albert Matthews. The influence of environmental conditions and botanical | XVII, 526 |
| PULLEN, Charles Kenneth. Tennessee's pupil transportation program: historical | | , 010 | II. The course of mild oxidation of saturated tertiary amines. | xvII, | , 506 | composition upon the nutritive value of rotationally grazed pasture forages. | XVII, 464 |
| background, analysis, and recommended procedures. | xvII | , 549 | SCAMEHORN, Howard Lee. The formative period of aviation in Illinois, 1890-1919. | XVII, | 614 | SMITH, Robert Leo. An evaluation of conifer plantations as wildlife habitat. | XVII, 465 |
| PYNE, Francis Ford. The relationship of measures of self concept, motivation and ability to success in competitive | | | SCHECHTER, Robert Samuel. Natural convection heat transfer in regions of | | | SMITH, William Edward. A study of factors contributing to the development of general motor skill. | XVII, 559 |
| athletics. | XVII | , 559 | maximum density. | XVII, | , 584 | SNYDER, Milton K. Sulfamide and some of its deammonation products. | XVII, 499 |
| QUINNELL, Clara Mae. Glucose utiliza- | | | SHELLY II, Maynard Wolfe. Response sequences in an elementary social situ- ation. The investigation of a man- | | | SOPER, Earl Francis. A study of the relationships between certain teacher-school | |
| tion and polysaccharide production by Azotobacter indicum. | XVII | , 479 | machine system. SCHILLING, Eugene Dudleigh. Chemical | XVII | , 688 | characteristics and academic progress, as measured by selected standardized tests, of elementary pupils in grades | |
| QUACKENBUSH, Orville Francis. The development of the correctional, reforma tory, and penal institutions of Minnesota: | | | studies on a toxic factor from Lathyrus odoratus seeds. | XVII, | 498 | four, five and six of New York State public schools in cities under 10,000 | |
| a sociological interpretation. | | , 689 | SCHMIDT, Robert. Approximate analysis of domes. | XVII | , 586 | population. | XVII, 570 |

| SOULE, JR., Ralph Pollister. Effects of chlortetracycline and oxytetracycline hydrochlorides on the carcass character- | | | XVII, 458 | WHITE, Lowell Deane. The gyromagnetic ratio of the electron in the metastable state of hydrogen. | XVII, 654 |
|---|------------------------|--|-----------|--|------------|
| istics of market pigs. STAHELI, Donald Lafayette. A study of | XVII, 595 | | XVII, 606 | WHITE, Maxwell William. The lateral- | , |
| the factors affecting the nutritive value | XVII, 463 | TROTTER, Hale F. Convergence of semi-groups of operators. | XVII, 645 | torsional buckling of yielded structural steel members. | XVII, 587 |
| STANLY, Thomas Jackson. Suggested | AVII, 100 | TSAKONAS, Stavros. Divided flow through a divergent inlet conduit. | XVII, 589 | WHITLOCK, James William. The assembly in public high schools in the United States. | |
| production goals for farm enterprises in Louisiana. STARK, Joel. An investigation of the re- lationship of the vocal and communica- | XVII, 554 | TULINSKIE, Alexander. An X-ray crystallographic study of disorder in certain hexa-substituted benzene | | WIEGAND, Donald Arthur. Luminescent and photoconducting properties of crystalline silver chloride. | XVII, 657 |
| tive aspects of speech competency with | XVII, 696 | derivatives. TURK, Fateh M. The biological relationship between the oak wilt pathogen, Endoconidiophora fagacéarum Bretz, | XVII, 515 | WILLIAMS III, George Abiah. A. Nuclear magnetic resonance spin-spin multiplets in liquids. B. The effect of pressure on | VIII 610 |
| trends in the administration of the read- ing program. | XVII, 551 | and the fungi found in wilted oak trees. | XVII, 459 | some quadrupole interactions. WILLIAMS, Wendell Sterling. Low | XVII, 516 |
| STIRLING, William Leake. Beta and gamma spectra of yttrium-88 and | | TURNER, Harold Edward. A study of public school integration in two Illinois communities. | XVII, 536 | temperature thermal conductivity of KCl-KBr mixed crystals. | XVII, 655 |
| rhodium-102. STRACHER, Alfred. End group studies of | XVII, 660 XVII, 498 | communics. | 111, 000 | WILLINGHAM, James Wesley. The esti- mation of forest management inventory data from aerial photographic measure- | |
| STRAUSS, Armar Archbold. The uptake and metabolism of potassium cyanide-C14 | | UNTERECKER, John Eugene. A study of | | ments. WILSON, JR., Charles Zachary. The | XVII, 466 |
| | XVII, 489 | the function of bird and tree imagery in | XVII, 637 | development and testing of methods of measuring productivity. | XVII, 519 |
| or Grignard reagents to 9-phenanthryl ketones. SULLIVAN, Ernest G. An experimental | XVII, 507 | | | WINEMAN, Walter Ray. Calendar of the Landon Carter papers in the Sabine Hall Collection and a biographic sketch of Colonel Landon Carter. | XVII, 606 |
| study of the relationships between physi- cal characteristics and subjective evalu- ation of male voice quality in singing. | XVII, 646 | VAUGHAN, Leland Maynard. A thermo- dynamic study of the effects of polyphenyl and carbonyl groups. | XVII, 515 | WISE, Wayne Wilmar. Tonal relationship through interchangeability of mode in the music of the eighteenth and nineteenth centuries. | XVII, 647 |
| | XVII, 646 | WALKER, Don DeVere. The Popular Science Monthly, 1872-1878: a study in | | WITTWER, Leland Stanley. Effects of storage methods upon nutrient losses and feeding value of ensiled legume and grass forage. | XVII, 459 |
| TANKERSLEY, JUNIOR, Robert Walker. Studies on acquired cellular immunity to herpes simplex. | XVII, 481 | the dissemination of scientific ideas in America. | XVII, 616 | womack, Bob J. The enactment of a state school program in Tennessee. | XVII, 553 |
| TAUSSIG, Peter Richard. Thermal de- composition reactions of cyclononane | | WALSH, Thomas Francis. Hawthorne's handling of point of view in his tales and sketches. | XVII, 623 | WORLAND, Stephen Theodore. Saint Thomas Aquinas and the modern theory of economic welfare. | XVII, 527 |
| TAYLOR, Joshua C. William Page: | XVII, 508 XVII, 594 | WATSON, Ora Vesta Russell. A compara- tive demographic analysis of two | | WORTHINGTON, Richard Albert. A re- view of doctoral dissertations in music education. | W1777 E277 |
| TEMPLE, Wayne Calhoun. Noah Brooks, | XVII, 615 | Louisiana cities: Baton Rouge and Shreveport. | XVII, 691 | education. | XVII, 537 |
| TERRY, Miriam Alice. Social values of | | WELLS, JR., Chester Millington. Factors in the market for soybean oil meal in | | | |
| selected organizations. THOMAS, Arthur Louis. Studies of laminar pre-mixed methane-air flames: the flame attachment zone and flame | XVII, 690 | the United States. WARE, JR., George Whitaker. The relation of the structure of a series of cholinesterase inhibiting insecticides to | XVII, 518 | YAHR, Charles Corbin. Present economy and potential development of the Baluchistan States of Pakistan. | XVII, 596 |
| propagation rates along a nichrome | XVII, 584 | synergism and antagonism with piper- onyl butoxide on the housefly, Musca | | YATES, Leonard Arthur. A comparative study of socialization in physical education due to class organization. | XVII, 560 |
| THOMAS, Charles Hill. Heritability estimates of body weight, gain, feed con- sumption, and feed efficiency, and the genetic, environmental, and phenotypic | | domestica (L.). WERNTZ, JR., James Herbert. The liquid helium II film gravitational volume flow rate over 36 centimeter | XVII, 704 | YOUNG, George Allen. The control of temperature stresses in concrete gravity dams. | XVII, 587 |
| correlations between these traits in New Hampshire broilers. | XVII, 483 | barriers. WEST, JR., William Ernest. Oxidation | XVII, 654 | YU, Yung-Fang. Oxidation of metals in the thin film region. | XVII, 492 |
| TORRES-PERALTA, Sarah Esther. The Labor Management Relations Act and the | | processes in the recovery of sulfur dioxide from waste gasses. | XVII, 585 | | |
| Puerto Rico Labor Relations Act: a general comparison. | XVII, 668 | WESTNEAT, David French. I. Design and construction of an automatic recording unit for a Beckman Model DU spectrophotometer. II. A study of the reaction between calcium and certain hydroxy- | | ZINKE, Otto Henry. Auger effects in metals. | XVII, 657 |
| | | anthraquinones. | XVII, 500 | | |







DISSERTATION ABSTRACTS

Volume XVII, No. 4

1957